Fire Prevention and Protection

The Spectator Company.

Watkins Automatic Fire Alarm

Protects more than 2000 buildings.

For estimates appy to

Automatic Fire Alarm Co.

416 Broadway New York City

THE SPECTATOR

AN AMERICAN REVIEW OF INSURANCE.
PUBLISHED WEEKLY. PRICE $4 PER ANN.

(ESTABLISHED 1868.)

THE SPECTATOR is a live and progressive insurance journal, noted for its pungent and fearless discussion of all matters pertaining to the vast subject of insurance and allied interests in every branch. In the many years of its existence it has built up a reputation for fair and honest treatment of insurance matters that has made it invaluable to property owners desiring insurance and to insurance men of every class. It contains the latest and freshest insurance news from every quarter, bright and sparkling correspondence from the principal insurance centres of the country, comments on current insurance events of the day, with special departments showing what underwriters are doing, *together with the latest improvements in fire prevention and protective appliances.*

The most eminent writers on insurance in its various forms and kindred topics are contributors to its columns, and the aim of its proprietors is to present the science of the insurance systems in vogue without prejudice to any and in fairness to all. It is in this spirit that FIRE, Life, Accident, and Miscellaneous Insurance Companies, Associations and Societies are treated without fear or favor. It also gives the current news from different insurance centres each week, and each number is an epitome of all matters pertaining to insurance. It is the ambition of its proprietors to make THE SPECTATOR an invaluable journal to the commercial and business world, *to manufacturers of everything tending to the elimination of the fire hazard* and to every person identified with the insurance interest in any capacity.

TH
9210
S74
1900
NMAH

1900

FIRE PREVENTION
AND
PROTECTION

CONTAINING INFORMATION FOR INSURER AND INSURED CONCERNING THE MATERIALS AND DEVICES ADAPTED TO THE PREVENTION AND EXTINGUISHMENT OF FIRE; ALSO EMBRACING HINTS TO THE INSURED AND STANDARD POLICY FORMS, WITH COMPREHENSIVE INDEX TO SAME

Corrected to June, 1900.

1900:
THE SPECTATOR COMPANY
95 William Street, New York

Entered, according to Act of Congress, in the year 1900, by The
Spectator Company, in the Office of the Librarian of
Congress, at Washington, D. C.

SMITHSONIAN
LIBRARY

GT34
S741
1900

TABLE OF CONTENTS.

PAGE.
Preface 11

FIRE PREVENTION AND EXTINGUISHMENT.

Acetylene Gas Generators and Lamps 49
Acetylene Gas, Rules Governing Use of 49
Acetylene Stoves 58
Air Pressure and Gravity Tanks 78, 93, 96
Air Spaces to be Avoided, Inaccessible 16
Alarms, Automatic and Other Fire 61
Apparatus, Miscellaneous Non-Automatic Fire-Fighting 107
Approved Electrical Fittings 149
Arc Lamp Hanger Boards 149
Area of Buildings 16
Armored Cables 150
Asbestos and Magnesia Pipe Coverings 31
Asbestos Sheathing 19
Asbestos Wall Coverings 40
Ash Cans, Metal 37
Automatic Chemical Fire Extinguishing Systems 97
Automatic Elevator Guards 26
Automatic Fire Alarms 61
Automatic Fire Alarm, Rules Concerning 66
Automatic Fire Doors, Shutters and Hatch Covers 20
Automatic Sprinklers, Development of 73
Automatic Sprinklers, List of 74
Automatic Sprinkler Systems, Rules Governing 83
Barrel Heaters 36
Benzine, Safety Cans for 36, 37
Box Anchors, Post Caps, Etc 37, 38
Brilliant Gas Lamp Co., Chicago, Ill 46, 47
Bucket Tanks 105
Buckets, Pails, Etc., Fire 105
Building Construction 15
Building, The Standard 15
Bushings 149
Cables, Armored 150
Calcium, Carbide of 58
Canopy Insulator 150
Carbonic Acid Gas Extinguishers, Standard for 99
Carbide of Calcium 58
Cast-Iron Lining for Flues 15
Ceilings and Side Walls to be Avoided, Combustible 15
Ceilings and Partitions, Fireproof 17
Chemical Fire Extinguishers, Non-Automatic 99
Chemical Fire Extinguishers, Standard for 99

PAGE
Chemical Fire Extinguishing Systems, Automatic 97
Chemical Fire Pails 105
Circuit-Breakers 150
Cleats 150
Clocks and Watches, Watchmen's 61, 70
Coal Oil Vapor Lamps 45
Conduits 150
Construction of Buildings 15
Cooking, Heating and Lighting Appliances 43, 58
Cornices Must be Incombustible 16
Couplings, Nozzles, Etc 109
Coverings for Pipes, Asbestos, Magnesia, Etc 31
Cutouts 150
Door and Window Guards 36
Doors and Windows to be Protected 15
Doors, Shutters and Hatch Covers, Automatic Fire 20
Electric Heating and Cooking Appliances 58
Electrical Fittings, Approved—
  Arc Lamp Hanger Boards 149
  Asbestos Boards, Sheets and Tubes 149
  Bushings 149
  Cables, Armored 150
  Canopy Insulator 150
  Circuit-Breakers 150
  Cleats 150
  Conduits 150
  Cutouts 150
  Flexible Cords 151
  Fuse Links 151
  Insulating Joints for Fixtures 151
  Lightning Arresters 152
  Protectors 152
  Rosettes, Fused and Fuseless 152
  Sockets and Receptacles for Incandescent Lamps 152
  Spark Arresters 152
  Switches, Knife, Snap, Flush, Door and Series Arc 153
  Wires—Rubber Covered 156
    Slow Burning Weatherproof and Slow Burning 156
    Weatherproof Line 156
    Conduit 156
  Non-Combustible and Non-Absorptive Insulating Materials 156
Electrical Rules, National 115, 117
Elevators and Stairways to be Cut Off 15
Elevator Guards, Automatic 26
Engines, Hand Fire 102
Escapes, Fire 111
Explosion Preventors for Malt Mills 36
Extinguishers, Non-Automatic Chemical Fire 99
Fabric Fireproofing Materials 19
Fire Alarms and Watchmen's Clocks 61
Fire-Brick Lining for Flues 15
Fire Doors and Shutters, Description of 21
Fire Doors, Shutters and Hatch Covers 20
Fire Engines, Hand 102
Fire Escapes 111
Fire Extinguishers, Non-Automatic Chemical 99

	PAGE
Fire Extinguishing Appliances and Water Supplies	73
Fire Extinguishing Systems, Automatic Chemical	97
Fire-Fighting Apparatus, Miscellaneous Non-Automatic	107
Fire Pails, Chemical	105
Fire Preventive Materials and Devices	17
Fireproof Doors and Windows to be Used in Exposed Situations	40
Fireproof Paints	19
Fireproof Partitions and Ceilings	17
Fireproof Roofing Materials	20
Fireproof Sheathing	19
Fireproofing of Wood and Fabrics	19
Fire Stops Required	16
Fittings, Approved Electrical (See Electrical Fittings)	149
Flexible Cords	151
Floor Timbers to be Protected from Flues	15
Flooring Buildings, Method of	15
Flues, Lining of	15
Flues, Thickness of Walls of	15
Flues, Throat Capacity of	15
Frame Rear Buildings and Extensions, Avoid	16
Fuse Links	40
Gas Jet Wire Guard	40
Gasoline Generators, Lamps and Stoves	45
Gauges, Hydrants, Valves, Etc	79
Generators and Lamps, Acetylene Gas	49
Generators, Lamps and Stoves, Gasoline	45
Glass Prisms	32
Glass, Wire	32
Gravity and Air Pressure Tanks	78, 93, 96
Guards for Doors, Windows and Skylights	36
Hatch Closers, Rules Concerning Automatic	20
Hatch Covers, Automatic Fire Doors, Shutters and	20
Heating, Lighting and Cooking Appliances	43, 58
Heating of Standard Building	15
Hose, Racks, Reels, Carts, Etc	108
Hydrants, Gauges, Valves, Etc	79, 109
Index to National Electrical Code	145
Indicator Post, Valve	79
Insulating Joints for Fixtures	151
Insulating Materials, Non-Combustible and Non-Absorptive	156
Insulator, Canopy	150
Iron Columns	15
Ladders, Trucks, Etc	108
Lamps and Generators, Acetylene Gas	49
Lamps, Stoves and Generators, Gasoline	45
Lanterns, Safety	36, 37
Life-Saving Apparatus	111
Lightning Arresters	152
Lightning Rods	40
Lighting, Heating and Cooking Appliances	43
Lighting of Standard Building	15
Magnesia and Asbestos Pipe Coverings	31
Magnetic Separators for Malt Mills	36
Mansard and Shingle Roofs to be Avoided	16
Metal Ash Cans	37
Metal Walls and Ceilings	17

PAGE
Metallic Studs and Lathing, Use of 15, 37
Mica Gas Globe Canopies, Etc 40
National Electrical Code 117
National Electrical Code, Index to 145
Non-Automatic Chemical Fire Extinguishers 99
Non-Automatic Fire-Fighting Apparatus, Miscellaneous 107
Non-Combustible, Non-Absorptive Insulating Materials 156
Nozzles, Couplings, Etc 109
Oily Waste, Safety Cans for 35, 37
Pails, Buckets, Etc., Fire 105
Pails, Chemical Fire 105
Paints, Fireproof 19
Partitions and Ceilings, Fireproof 17
Pipe Coverings, Asbestos, Magnesia, Etc 31
Post Caps, Box Anchors, Etc 37, 38
Pressure and Gravity Tanks, Air 78, 91, 93, 96
Prisms, Luminous Glass 32
Protectors, Electric Battery Circuit 152
Pumps, Makers of 77
Racks, Reels, Carts, Etc., Hose 108
Requirements for Standard Buildings 15
Roof Should be of Fireproof Material 16
Roofing Materials, Fireproof 20
Rosettes, Fused and Fuseless 152
Rules Governing Electrical Installations 115, 117
Safety Cans for Oily Waste, Benzine, Varnish 35, 37
Safety Devices, Miscellaneous 35
Safety Lanterns 36, 37
Shafts to be Avoided, Light and Elevator 16
Sheathing, Fireproof 19
Shingle and Mansard Roofs to be Avoided 16
Shutters and Hatch Covers, Automatic Fire Doors 21
Skylight Guards 36
Sockets and Receptacles for Incandescent Lamps 152
Spark Arresters 36
Spark Guards 37
Sprinkler Systems, Rules Governing Automatic 83
Sprinklers, Development of Automatic 73
Sprinklers, List of Automatic 74
Stairways and Elevators to be Cut Off 15
Standard Building, The 15
Steam Boilers are Used, Size of Flues Where 15
Steel Walls and Ceilings 17
Steel Columns, Hazards of 15
Stoves, Acetylene 58
Stoves, Lamps and Generators, Gasoline 45
Switches, Knife, Snap, Flush, Door and Series Arc 153
Tanks, Gravity and Air Pressure 78, 93, 96
Terra Cotta 19
Thermostats 61
Time Recorders for Watchmen, Etc 61, 70
Tin-Covered Doors for Elevators and Stairways 15
Trucks, Ladders, Etc 108
Valves, Gauges, Hydrants, Etc 79, 89
Varnish, Etc., Safety Cans for 36
Watchmen's Clocks and Watches 61, 70

PAGE
Wall Coverings, Fireproof 40
Walls, Thickness of 15
Water Supplies and Fire Extinguishing Appliances 73, 76, 87
Water Supply Materials 76
Window and Door Guards 36
Wire Glass 32
Wires—Rubber Covered 156
  Slow Burning Weatherproof and Slow Burning 156
  Weatherproof Line 156
  Conduit 156
Wood and Fabrics, Fireproofing of 19
Wooden Beams, Girders and Pillars 15
Wooden Cornices and Awnings, Avoid 16

CONDITIONS AND RESTRICTIONS OF FIRE INSURANCE POLICIES.

Cancellation Tables, Short Rate 207
Clauses, Policy 177
Fire Hazards, The Rating of 197
Fire Insurance Policy Forms, Standard 161
Hints to the Insured 199
Index to Standard Policy Forms of New York and Massachusetts 165
Insured, Hints to the 199
Laws, Anti-Coinsurance 205
Laws, Anti-Compact 205
Laws, Deposit 205
Laws, Resident Agents' 205
Laws, Valued Policy 204
Massachusetts and New York, Index to Standard Policy Forms of 165
Massachusetts Standard Policy Form Opposite 162
New York and Massachusetts, Index to Standard Policy Forms of 165
New York Standard Policy Form Opposite 162
Policy Clauses 177
Policy Form, New York Standard Opposite 162
Policy Forms of New York and Massachusetts, Index to Standard 165
Policy Form, Massachusetts Standard Opposite 162
Policy Forms, Standard Fire Insurance 161
Rating of Fire Hazards, The 197
Short Rate Cancellation Tables 207
Standard Fire Insurance Policy Forms 161
Standard Policy Forms of New York and Massachusetts, Index to 165
Standard Policy Form of New York Opposite 162
Standard Policy Form of Massachusetts Opposite 162
Standard Policy Forms of Other States 163
Tables, Short Rate Cancellation 207

PREFACE.

In the preparation of this book it has been the aim of its publishers to place before merchants, manufacturers and underwriters, as succinctly and conveniently as possible, the knowledge necessary to the most thorough protection from fire and its consequent danger, trouble and loss. There are many methods by which the physical hazard of mercantile and manufacturing establishments may be so improved as to materially lessen the liability to fire, and also to command considerable reduction in premium rates for insurance. The latter consideration will appeal strongly to those who have been accustomed to exercising the utmost care in the preservation of their property in ordinary ways, but who would not care to go to the expense necessary to the fullest protection without the practical recognition of their effort and outlay in the form of a lessened expense for premiums.

The plan of this work includes the presentation of synopses of the various materials and devices which have been found useful in preventing or extinguishing fires, accompanied by such information as will enable a property owner to readily place himself in communication with the manufacturers of approved appliances and materials. In addition it has been deemed advisable to give information concerning the relations between insurer and insured, and to that end we have included herein reprints of the two leading standard policy forms, namely, those of New York and Massachusetts. Appended to these is an index covering both forms, which will enable the reader to find at a glance any clause in either policy form bearing upon any particular point upon which he may desire knowledge. Embodied in this work will be found a considerable amount of miscellaneous information all tending to give clearer understanding of matters connected with the prevention of or indemnification for damage by fire, as heretofore it has often happened that property owners have innocently and unconsciously violated policy conditions, with resultant vitiation of their insurance. Such cases, while they often occur, are seldom known to the insured except when developed by a fire loss, and then they frequently cause losses which might easily have been avoided by a proper understanding of the policy contract.

Parties wishing to introduce protective equipments in their establishments should first communicate with an insurance agent in their locality in order to be certain that the desired materials or appliances are approved, as the requirements of underwriters differ in various parts of the country.

In the hope that its contents will assist in producing a reduction of the annual fire loss, thereby benefiting both those who buy and those who sell insurance, this book is respectfully submitted to the business public.

THE SPECTATOR COMPANY.

New York, June 15, 1900.

FIRE PREVENTION
AND EXTINGUISHMENT.

CONSTRUCTION OF BUILDINGS.

In the erection of a building to be used for mercantile or manufacturing purposes there is room for considerable latitude both in directions of design and material. For convenience in adjusting premium rates to the various classes of buildings, underwriters have adopted specifications for the so-called standard building, which are given in brief below. Actual buildings, of course, vary materially from the "standard building" as outlined. For these variations charges or deductions are made according to their estimated influence upon the fire-resisting quality of a building as a whole; thus every improvement counts in favor of the propertyowner and every defect militates against him when the premium rate upon his building is fixed by the underwriters. Recognizing this, it is at once apparent that, aside from the owner's natural desire to prevent fire, which always destroys property which cannot be replaced, it is to his advantage to use every means in his power for the protection of his plant. The following general description of the standard building conveys a close idea of the requirements of insurance companies in that direction.

THE STANDARD BUILDING.

The standard building fixed upon by the constructors of the Universal Mercantile Schedule as the basis of its rate computations is briefly described as follows:

"One having walls of brick or stone (brick preferred), not less than twelve inches thick at top story (16 inches if stone), extending through and 36 inches above roof in parapet and coped, and increasing four inches in thickness for each story below to the ground, the increased thickness of each story to be utilized for beam ledges. Ground floor area not over 2500 square feet (say, 25 by 100); height not over four stories, or 50 feet; floors of two-inch plank (three inches better), covered by seven-eighths or one-inch flooring, crossing diagonally, with waterproof paper or approved fire resisting material between (if tin or sheet-iron between, see deductions); wooden beams, girders, and wooden story posts or pillars twelve inches thick, or protected iron columns; elevators, stairways, etc., cut off by brick walls or plaster on metallic studs and lathing, communications at each floor protected with approved tin-covered doors and fire-proof sills; windows and doors on exposed sides protected by approved tin-covered doors and shutters; walls of flues not less than eight inches in thickness, to be lined with fire-brick, well-burned clay or cast iron, and throat capacity not less than sixty-four square inches if steam boilers are used; all floor timbers to be trimmed at least four inches from outside of flue; heated by steam; lighted by gas; cornices of incombustible material; roof of metal or tile; if partitions are hollow or walls are furred off there must be fire-stops at each floor."

Variations from this standard receive due recognition in the making of premium rates, deductions being allowed for improvements and additional charges being made for defects in construction. Other factors than the actual physical condition of the insured building go to make up the premium rate upon it, such as the character of the fire department of the city or town, the risks by which the property is exposed, the hazard arising from occupancy of the insured building and those adjoining it, etc.; but with these it is not our purpose to deal. The property-owner is primarily only responsible for the condition of his own property, and that he should place in the strongest possible position for the prevention and extinguishment of fire, both for his own protection and that of his neighbor.

DEFECTS TO BE AVOIDED.

Insufficient Thickness of Walls.—Party walls should average four inches thicker than independent walls. When independent walls adjoin they need not be as thick as ordinarily. Use only brick and mortar of good quality.

Shingle and mansard roofs.

All inaccessible air spaces.

Combustible ceilings and side walls.

Excessive floor area.

Unprotected openings from floor to floor, such as elevator shafts, stairways, well holes, etc.

Wooden cornices, awnings, etc.

Dangerous lighting and heating systems.

Poorly constructed chimneys. Latter should be of ample size, with no woodwork near flues.

Frame rear buildings and extensions.

Stone columns carrying important weights. These yield quickly to action of fire and water, and are likely to disintegrate with disastrous results.

FIRE PREVENTIVE MATERIALS AND DEVICES.

By the proper application of fire-resisting and fireproof materials to mercantile and other buildings the fire hazard may be greatly decreased. It is possible, by the adoption of now available methods and materials, to erect a building which shall be almost absolutely fireproof. It would be built of brick and iron or steel, the latter protected at otherwise exposed points by asbestos or similar coverings, with windows and skylights protected by wire-glass, prisms and fire shutters, all openings having automatic fire-doors and hatches, and woodwork avoided as far as possible, and such as was necessary treated with fireproof paint. There would be scarcely a possibility of such a building igniting, much less being destroyed when unoccupied. When sheltering a mercantile stock or a manufacturing plant the hazard of the contents would need to be provided against by means of automatic fire alarm and sprinkler systems and other agencies for the suppression of fire. Many of these means of giving alarm of and extinguishing fires are mentioned hereafter.

FIREPROOF PARTITIONS AND CEILINGS.

White Fireproof Construction Company, 162 West Twenty-seventh street, New York.

Mackolite Fireproofing Company, 1301 Schiller Bldg., Chicago, Ill.

Asbestos Wall Plaster.

King's Windsor Asbestos Cement.—Made by J. B. King & Co., 21 State street, New York.

Asbestic Wall Plaster.—Made by H. W. Johns Manufacturing Company, 100 William street, New York.

Steel Ceiling, Siding and Wainscoting.—Made by Kinnear & Gager Company, Columbus, Ohio.

Mineral Wool Lining.—Made by United States Mineral Wool Company, 143 Liberty street, New York; Columbia Mineral Wool Company, Chicago, Ill.

Stamped Steel Ceilings.—Made by H. S. Northrop, 40 Cherry street, New York.

Metal Ceilings.—Made by New York Metal Ceiling Company, Twenty-first street and Thirteenth avenue, New York.

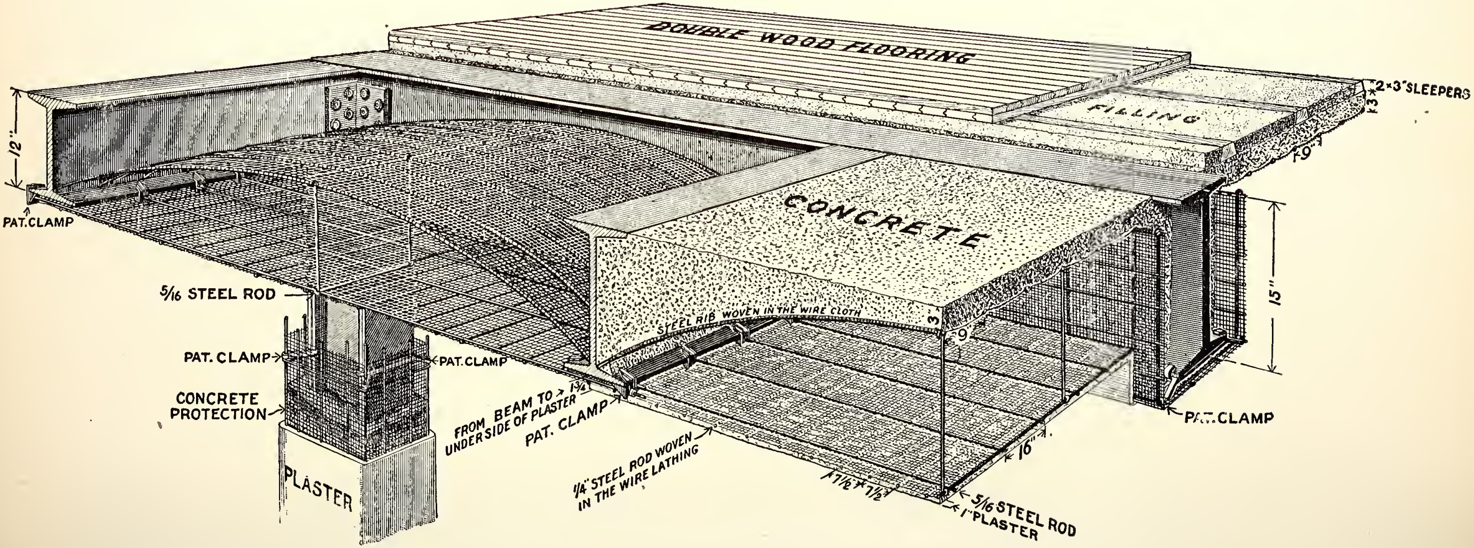
Metal Ceilings and Roofing.—Made by Canton Steel Roofing Company, Canton, Ohio; Berger Manufacturing Company, Canton, Ohio; Gara, McGinley & Co., 21 South Seventeenth street, Philadelphia, Pa.

Cabot Insulating Quilt.—Made by Samuel Cabot, 70 Kilby street, Boston, Mass.

Rabbitt Fireproof Partitions.—Made by S. E. Rabbitt, 918 F street, Northwest, Washinton, D. C.

Asbestos Linings, etc.—Sall Mountain Asbestos Company, 505 Chamber of Commerce Building, Chicago, Ill.

Asbestolith.—Made by the Asbestolith Company, Bennett Building, New York.



FIREPROOFING SYSTEM.

Metal Ceilings, Side Walls and Wainscoting.—Made by Brooklyn Metal Ceiling Company, 283 Greene avenue, Brooklyn, N. Y.

Roebling System of Fireproof Construction.—Made by Roebling Construction Company, 121 Liberty street, New York.

Terra Cotta.—Made by—
- White Brick & Terra Cotta Company, 156 Fifth avenue, New York.
- Pittsburgh Terra Cotta Lumber Company, Carnegie Building, Pittsburgh, Pa.
- Boston Fire-Brick Company, 164 Devonshire street, Boston, Mass.
- Henry Maurer & Son, 420 E. Twenty-third street, New York.
- Pioneer Fireproof Construction Company, Clark and Sixteenth streets, Chicago, Ill.
- Perth Amboy Terra Cotta Company, Perth Amboy, N. J.
- Staten Island Terra Cotta Lumber Company, 14 E. Twenty-third street, New York.
- East River Company, E. 124th street and Pleasant avenue, New York.
- Excelsior Terra Cotta Company, 287 Fourth avenue, New York.
- Glen Falls Terra Cotta & Brick Company, 156 Sixth avenue, New York.
- New York Architectural Terra Cotta Company, 38 Park Row, New York.
- Perth Amboy Company, 289 Fourth avenue, New York.

OTHER MANUFACTURERS OF FIREPROOF PARTITIONS, ETC.

Architectural Iron & Metal Ceiling Works, 420 E. Forty-eighth street, New York.

E. M. Heimerdinger & Co., 120 W. Fiftieth street, New York.

Lyles & Mills, 231 William street, New York.

Geo. W. Peck, 160 E. 129th street, New York.

Eastern Expanded Metal Company, 12 Brattle street, Boston, Mass.

FIREPROOFING OF WOOD AND FABRICS.

Electric Fire Proofing Co., 119 West Twenty-third street, New York. All kinds of wood rendered fireproof by electric fireproofing process. The electric fireproofing process is used exclusively by the United States Government, British Admiralty, French, Russian and Danish Governments for all woodwork in the construction of their warships.

FIREPROOF PAINT.

This subject has been investigated by a committee of the National Fire Protection Association which arrived at the conclusion that the matter of protecting wood work so as to make it practically fire resisting either by a wash, fire retarding paint, fire retarding covering or chemical treatment has not yet been fully developed. It was of the opinion that substances acting as a wood filler, converting the surface of soft porous wood to an approximation of hard wood and having great adhesive properties are perhaps the best fire retarding coverings to be recommended, and may be regarded as superior in elevator and light wells to such a covering as tin.

Jamieson Fire-Resisting Paint Company, 62 William street, New York.

Prince's Metallic Paint Company, 71 Maiden Lane, New York.

Barrett Manufacturing Company, New Orleans, La., (creosote wood preservative paint).

H. W. Johns Manufacturing Company, 100 William street, New York.

FIREPROOF SHEATHING.

Asbestos Building Felt, for sheathing or lining.

Asbestos Waterproof Sheathing, both fireproof and waterproof, composed exclusively of asbestos. Made by Barrett Manufacturing Company, New Orleans, La.

Asbestos Mill Board.—Made by the Philip Carey Manufacturing Company, Lockland, Ohio.

Gast's Asbestos Air Cell Fire Board.—Made by New York Fireproof Covering Company, 26 Cortlandt street, New York.

Asbestos Mill Board.

Asbestos Paper.—Made by Sall Mountain Asbestos Company, 505 Chamber of Commerce Building, Chicago, Ill.

Asbestos Building Felt.

Asbestos Sheathing.

Asbestos Fire and Damp-proof Paper.

Asbestos Mill-Board.

Made by H. W. Johns Manufacturing Company, 100 William street, New York.

FIREPROOF ROOFING MATERIALS.

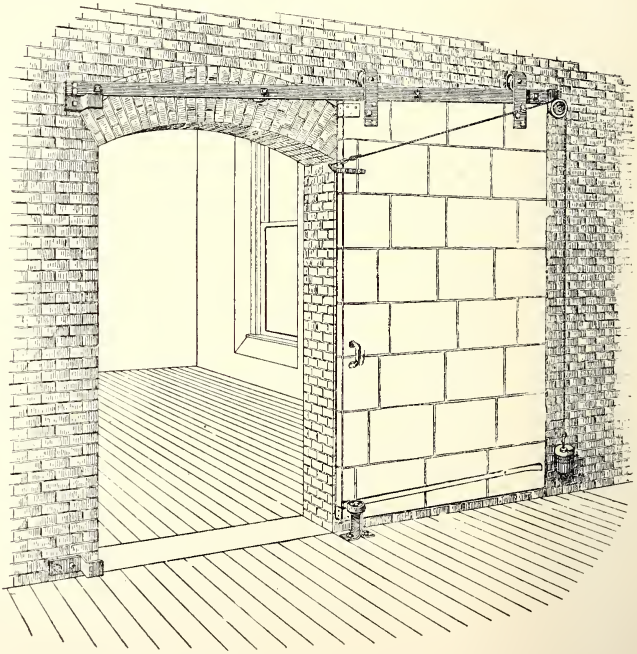
Barrett's Black Diamond; I. D. Fletcher Standard.—Made by Barrett Manufacturing Company, Hennen Building, New Orleans, La.

Improved—Five-ply Asphalt and Gravel Ready Roofing; Epure—Asphalt Ready Gravel Roofing.—Made by Trinidad Asphalt Manufacturing Company, St. Louis, Mo.

Johns Asbestos.—Made by H. W. Johns Manufacturing Company, 100 William street, New York.

Magnesia Flexible Cement.—Made by Philip Carey Manufacturing Company, Lockland, Ohio.

Ruberoid.—Made by Standard Paint Company, 81 John street, New York.



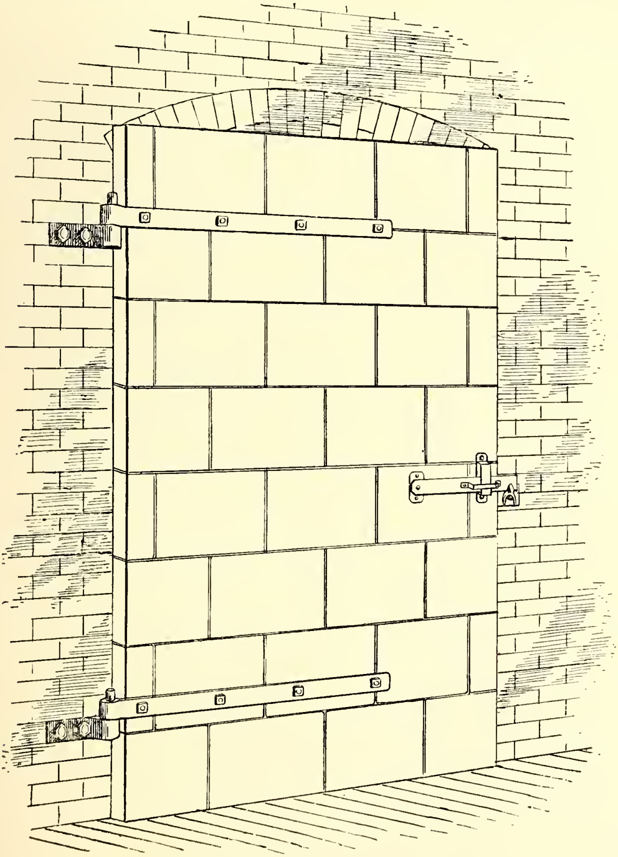
Sliding Fire Door (Open).

Ready Gravel Roofing.—Made by O. A. Smith & Co., 27 Walton street, Atlanta, Ga.

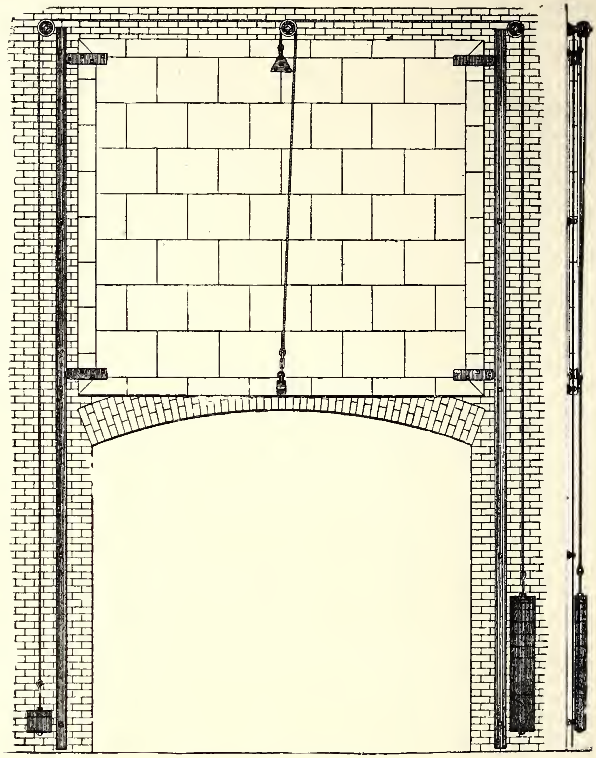
Metal Roofing Tiles.—Made by Merchant & Co., 517 Arch street, Philadelphia, Pa.

FIRE DOORS AND SHUTTERS.

Tin-covered fire doors and shutters have proved very effective in preventing the spread of fire through the necessary openings in the walls of buildings. A door or shutter composed of wood covered with tin will withstand an intensely hot fire, but it must be properly constructed. The specifications, in brief, of the Factory Insurance Association, whose headquarters are at Hartford, Conn., require that doors shall be 2½ inches thick, consisting of three layers of clear, narrow, matched and well-seasoned white pine or similar wood, put together at right angles with the outside courses perpendicular. A door should overlap the opening four inches at sides and top, and the top should pitch three-quarters of



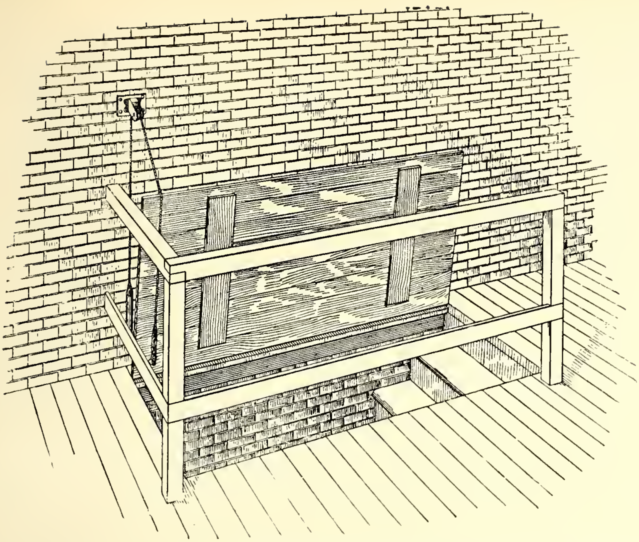
Swinging Fire Door.



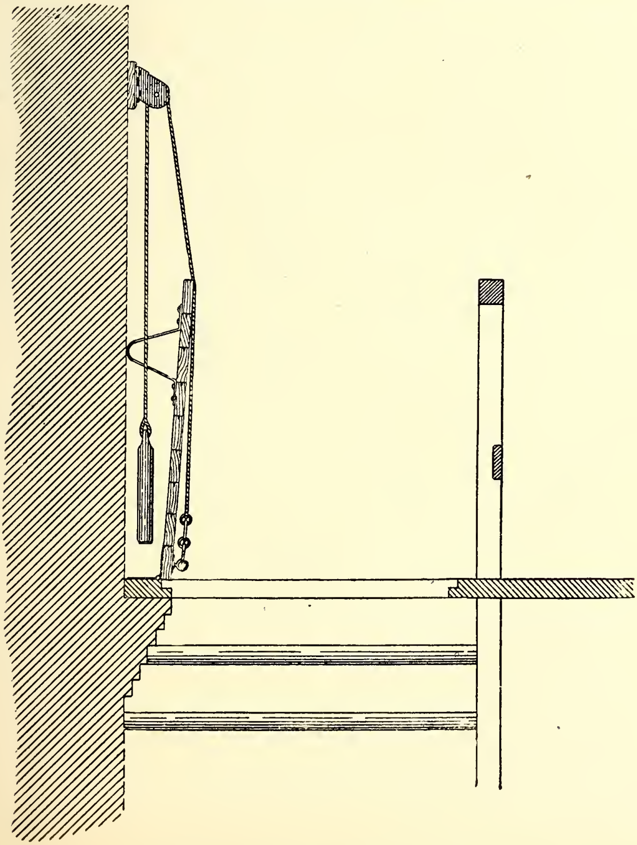
VERTICAL FIRE DOOR.

an inch to the foot to conform to the incline of the track. The nailing together with wrought iron clinch nails should be done on a heavy iron plate, in order that nails may be well clinched without roughening the surface. The door should then be covered with "14 x 20" tin or terne plates, I. C. standard, 108 pounds to box. (Never use zinc.) All joints should be double locked or lapped and thoroughly nailed under seams. Do not nail outside or use solder, and do not paint unless necessary to resist rust. In that case, first apply a coat of asphaltum. The trimmings for the door are as follows: Front—Chafe iron, a flat strip near bottom to engage stay roll. This should be at same angle as top of door. Wedge to force door against wall when closed, by contact with stay roll. Edge plates to protect edge at stops at top and bottom. Large handle of wrought iron or steel. Back—Chafe iron, one inch, half round, placed one-third from bottom of door at same angle as top of door, ends at least six inches from edges of door. Handle, countersunk flush with surface of door. Door should close tightly against sides and top, and no obstructions should be permitted to interfere with its free action.

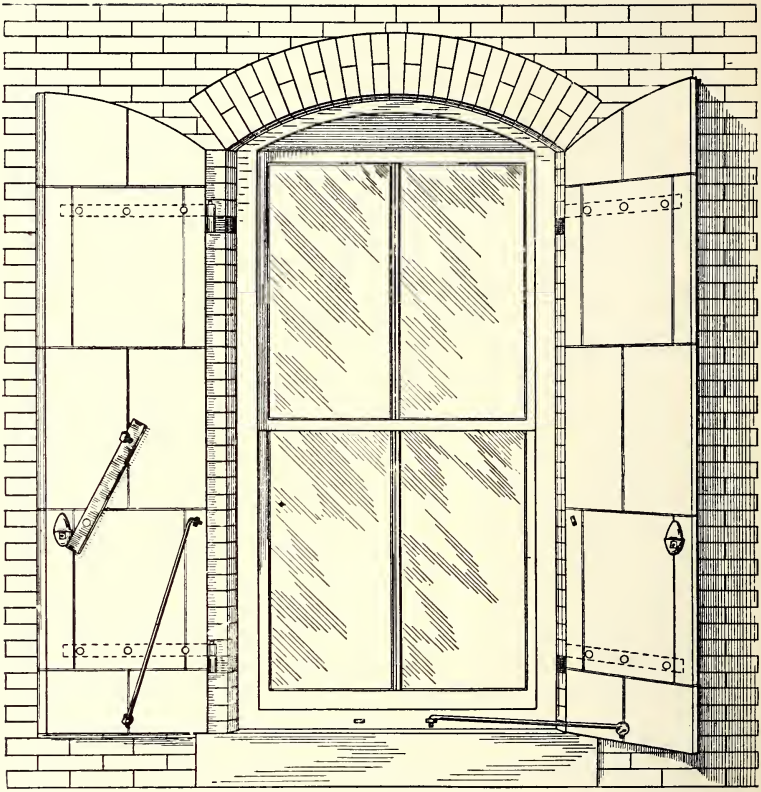
To hang the door, place it in the position it will occupy when closed, lifting it by wedges so that it will just clear the floor. Then bolt the track in place with an incline of three-quarters of an inch to the foot, one-quarter of an inch above top of door, and fix top



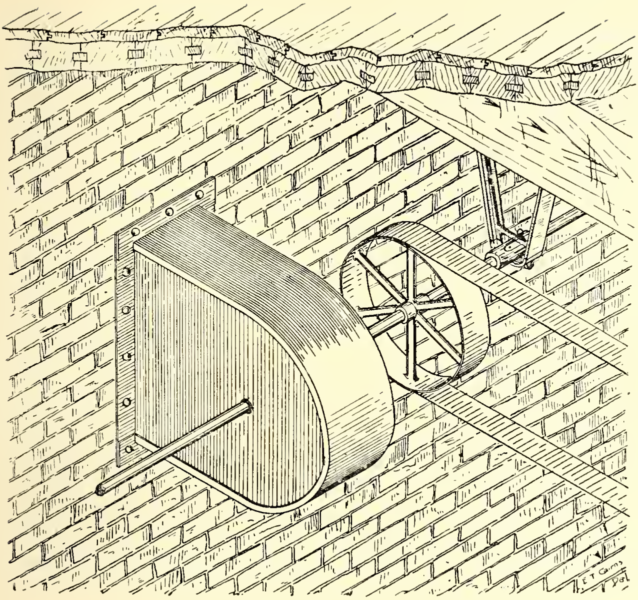
Automatic Trap Door, Arranged to Close When Heat Melts Fusible Link.

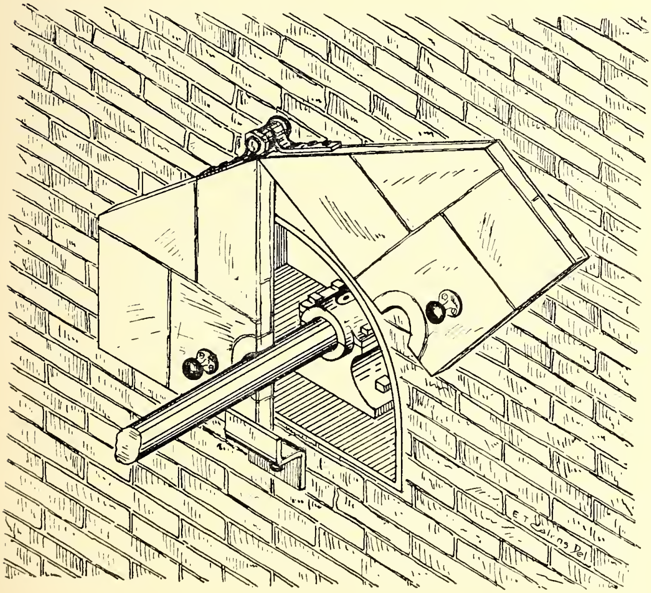


Automatic Trap Door, End View.



Fire Shutters, Tin-Covered.





Wall Opening Protectors, for Preventing Spread of Fire Through Openings for Belting and Shafting.

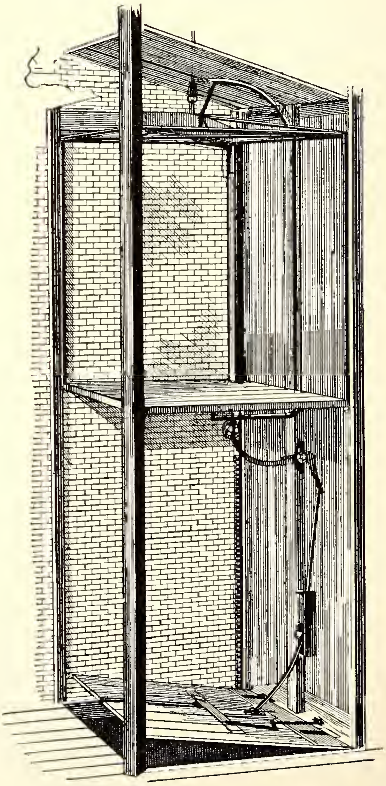
stop in place. Place hangers on track and mark carefully the location of bolt-holes on the door. Bore holes precisely where marked, and bolt hangers to door. Bolt bottom stop to wall four to eight inches from floor, adjusting it so that door will enter and strike both stops at the same time. Fasten stay roll to floor with lag screws, adjusting it so that the door may move freely, but the wedge on door will strike and force door against wall. Attach plate with arm for holding fusible link extending beyond front edge of door near top. Fasten pulley for rope to upper end of track, with bumper adjusted to stop door when it has cleared opening; then attach weights to balance door.

The door thus hung may be readily opened and closed by hand, and heat necessary to melt the link (160 degrees) would cause the release of the weights, when the door would close by gravity.

The sill below the door should be of stone or wrought iron or steel, preferably the latter. This forms a non-combustible separation between the floors on either side of the door.

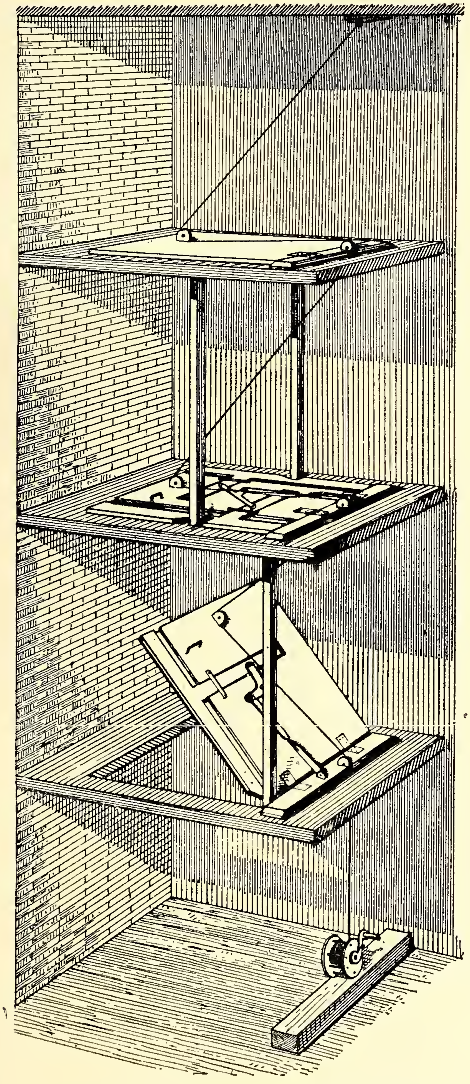
Swinging and vertical fire doors are required to be built in practically the same manner, with some necessary variations in the manner of hanging them.

Trap doors may be made to close automatically by balancing them open by means of a weight hung by a rope and a fusible link.

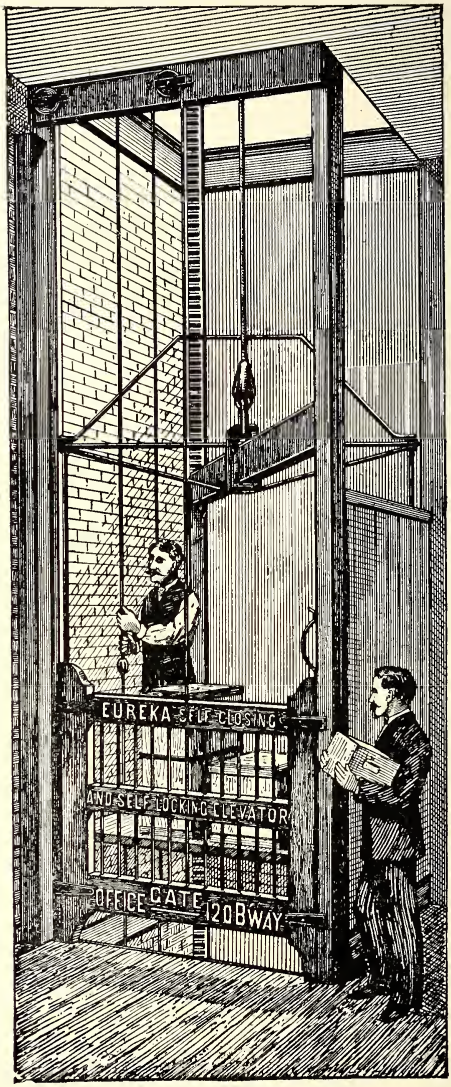


AUTOMATIC COVER FOR ELEVATORS.

Vertical and trap doors should be balanced by two weights, the smaller being released, in case of fire, by means of a fusible link, while the larger one, attached to the door by a wire cable passing through a pulley, would permit the door to close gently and without endangering life or limb.



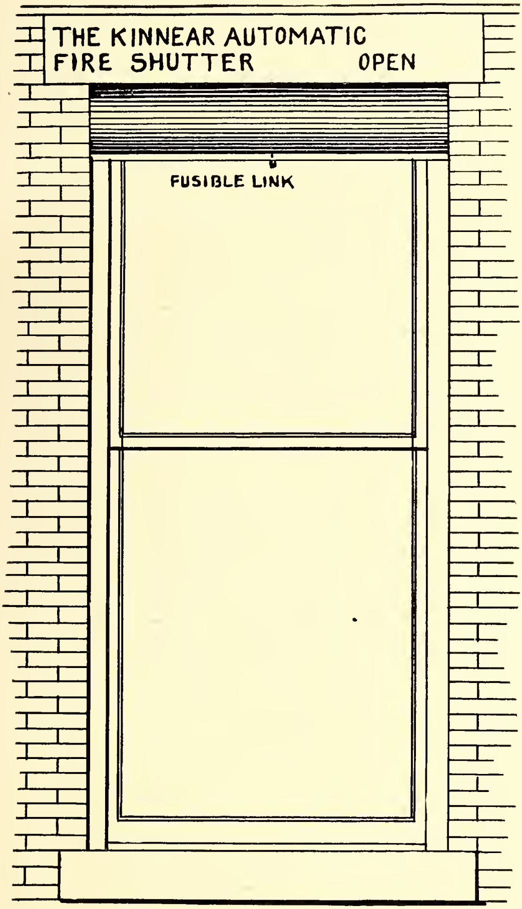
ADJUSTING COVERS FOR ELEVATOR AND AIR SHAFTS.



SELF-CLOSING AND SELF-LOCKING
ELEVATOR GATE.

Fire shutters should be constructed of two thicknesses of seven-eighths inch stock, put together and covered in the same manner as the doors. When in pairs they should have one inch rabbet at junction. Pin blocks should be set firmly in brickwork, preferably while building. Hinges of wrought metal should extend three-quarters of the width of shutter and be securely bolted. Locking bar must have square bolt, and handle must have ring on outside, to enable shutter to be opened by hand or fire-hook from outside. Hooks may be attached to hold shutters open.

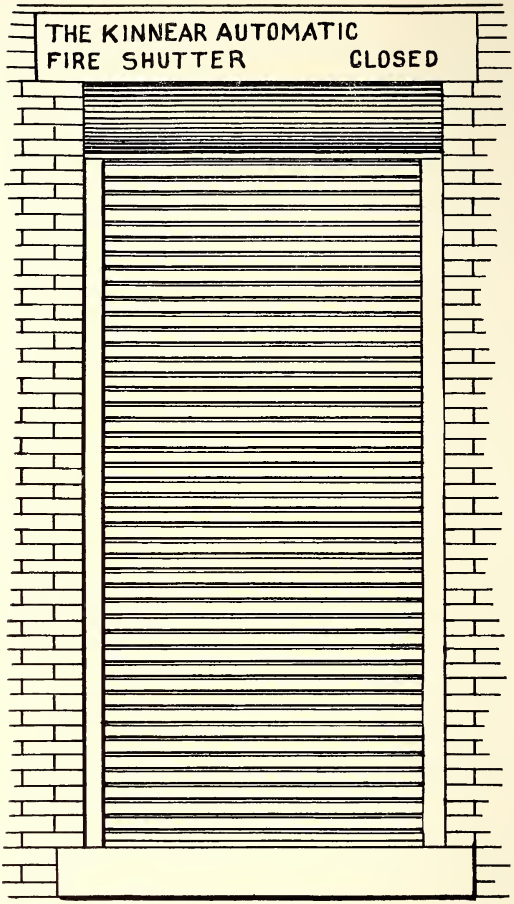
Automatic devices are now made whereby necessary belt and shaft openings in walls may be protected.



Kinnear Automatic Self-Closing Steel Rolling Fire Shutter (Open).

FIRE DOORS AND SHUTTERS.—Made by—

Howarth Brothers' Company, 304 Market street, Newark, N. J.
Bardsley Brothers, 147 Baxter street, New York.
Architectural Sheet Metal Works, 435 W. 144th street, New York.
Morse, Williams & Co., 19 Pearl street, Boston, Mass.



KINNEAR AUTOMATIC SELF-CLOSING STEEL ROLLING FIRE SHUTTER (CLOSED).

Holyoke Machine Company, Holyoke, Mass.
Elevator Guard & Hatch Company, 139 Charles street, New York.

Rolling Steel Doors, Shutters and Partitions.—Made by—
Kinnear & Gager Company, Columbus, Ohio.
Jas. G. Wilson, 74 Twenty-third street, New York.

Automatic Fire Doors and Shutters.—Made by Lane Brothers, Poughkeepsie, N. Y.

Automatic Self-Closing Steel Rolling Fire Shutters.—Made by Kinnear & Gager Manufacturing Company, Columbus, Ohio.

Excelsior Automatic Hatch Covers and Self-Closing Gates.—Made by Excelsior Elevator Guard & Hatch Cover Company, 414 Bleecker street, New York.

Victor Automatic Fire Doors and Shutters.—Made by Victor Manufacturing Company, Newburyport, Mass.

Kinnear's Patent Fire Shutter.
Kinnear's Automatic Hinge.
Steel Paneled Fire Doors.
Made by Kinnear & Gager Company, Columbus, Ohio.
Wrought Iron Wheels and Hangers for Fire Doors.—Made by Albert Smith's Sons, Newark, N. J.
Eugene B. Hedden, 22 Clinton street, Newark, N. J.

PIPE COVERINGS.

"Standard Asbestos" Sectional Covering for high pressure steam pipes.
"Class C" Combination Asbestos and Felt Covering, for low pressure steam and hot water pipes.

ASBESTOS FIREFELT PIPE COVERING.

"Asbestos Cement Felting" (plastic), for boilers, domes, tanks, breeching and all irregular heated surfaces.
Carey's Asbestos Hot Blast Cement Felting. Made by the Philip Carey Manufacturing Company, Lockland, Ohio.
Gast's Asbestos Air Cell Pipe and Boiler Covering.—Made by New York Fireproof Covering Company, 26 Cortlandt street, New York.
Magnesia and Asbestos Blocks; Magnesia and Asbestos Cement.—Made by Valleau-Costigan Manufacturing Company, 184 North Eighth street, Brooklyn, N. Y.
K. & M. Magnesia Coverings.
Magnabestos Sectional Coverings.
Made by R. A. Keasbey, 83 Warren street, New York.
Asbesto-Sponge Felted Covering.
Asbestos Fire-Felt Covering.
National Covering.
Asbesto-Sponge Moulded Covering.
Asbestos and Hair-Felt Removable Covering.
Asbestos Cement Felting.
Asbesto-Sponge Cement Felting.
Asbestos Hot-Blast Cement Felting.
Asbestos Superator Jackets.
Asbestos Moulded Blocks.
Asbestos Sponge Hair Felt.
Asbestos Lining Felt.
Made by H. W. Johns Manufacturing Company, 100 William street, New York.
Hercules Asbestos Pipe Covering.—Made by Asbestos Manufacturing Company, 426 Market street, Philadelphia, Pa.
Asbestos Sectional Covering.

Asbestos Cement.
Wool Felt Covering.
Mineral Wool Sectional Covering.
  Made by Sall Mountain Asbestos Company, 505 Chamber of Commerce Building, Chicago, Ill.
Asbestos Fibroid Sectional Covering.
Asbestos Fibroid Plastic Covering.
Magneso Feltings.
Mineral Wool.
  Made by R. M. Gilmour Manufacturing Company, 84 John street, New York.

OTHER MANUFACTURERS OF PIPE COVERINGS.

Acme Covering Works, 84 John street, New York.
W. H. Van Wart, 130 Maiden Lane, New York.
Asbestos Felting Works, 79 Maiden Lane, New York.
F. W. Devoe & C. T. Raynolds Company, 103 Fulton street, New York.
J. E. Hintze, 79 Maiden Lane, New York.
Keasbey & Mattison Company, 116 William street, New York.
Peter Sullivan, 183 Christopher street, New York.
Kavlin Standard Company, 150 Nassau street, New York.
Salem Mineral Wool Manufacturing Company, 79 Cortlandt street, New York.
Fossil Meal Company, 2 Cedar street, New York.
W. H. Stewart, 182 Front street, New York.
Hardy & Tierney, 410 E. Twenty-third street, New York.
W. H. James, 89-91 Centre street, New York.
Manville Covering Company, 88 John street, New York.
E. E. Mooney, 388 Second avenue, New York.

GLASS PRISMS.

In the last few years the idea of refracting sunlight by means of glass prisms and thus throwing light into dark interiors and cellars has met with ready acceptance. Aside from its primary use as indicated above it has been found that when the prisms are set in hollow, fireproof metal frames they are excellent fire retardents, and their utility in this direction is recognized by underwriters and municipal authorities. These prisms are made about four inches square.

A series of tests have been conducted by a committee of the National Fire Protection Association with a view to learning the possibilities of glass prisms as fire retardants. This committee reported that the tests so far made would indicate that in good fireproof window frames and possibly with glass units reduced in size, electro glazed windows may be useful under certain conditions as fire retardants.

The following named companies make glass prisms of the character described:

Luminous Prism Company, Chicago, Ill.
American Luxfer Prism Company, Chicago, Ill.
Daylight Prism Company, 128 South Fourth street, Philadelphia, Pa.
Prismatic Light Company, 26 Beaver street, New York.

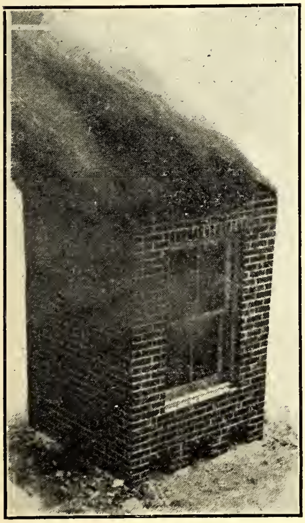
WIRE GLASS.

As its name indicates, this material consists of plates of glass in which are embedded wire netting, designed to keep the pane intact even though the glass itself may be cracked by the action of intense heat and the sudden application of water. The wire glass made by different manufacturers has been subjected to very severe tests, which have demonstrated that it will successfully resist the action of fire up to about double the temperature required to melt ordinary glass. It has been shown that hollow, fireproof metal frames, carrying panes of 15 x 24 inches or less, yield the best results.

Wire glass was made the subject of investigation by a committee of the National Fire Protection Association, who reported upon it very favorably. Both classes of wire glass, viz.: the solid glass (that in which the wire is imbedded in the casting) and the "sandwich" glass (in which the wire is pressed between two plates of glass) were found to withstand very severe tests and should be used in all cases where windows are exposed by adjoining buildings, and where it is not feasible to use standard shutters. It is advantageous to use the wire glass in connection with shutters where possible. Wire glass used for protective purposes should always be set in metal frames and the best results are attained by using moderately small panes.

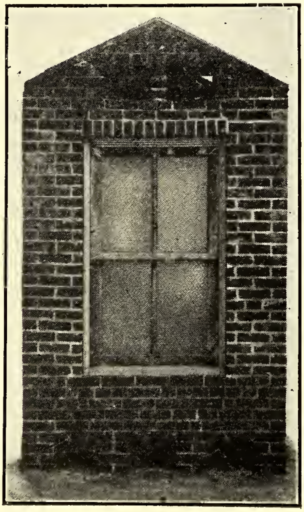
"APPERT WIRE GLASS."

APPERT GLASS CO., 135 BROADWAY, NEW YORK.



Fire Test Burning 1½ hours.
Fire hose used several times.

Perfect Fire Retardent. Made in plain or figured glass.



Lights unharmed at end of test.

Appert Glass Company, 135 Broadway, New York.—Makes "Appert Wire Glass"—wire evenly centered in sheet: perfect surface.

Mississippi Glass Company, St. Louis, Mo.—Makes "Solid" glass, the wire being embedded in it when in a molten state.

Wire glass in various patterns is also manufactured by:
Davis Glass Company, Pittsburg, Pa.—Makes "Besto" glass.

Wire Glass.

MISCELLANEOUS SAFETY DEVICES.

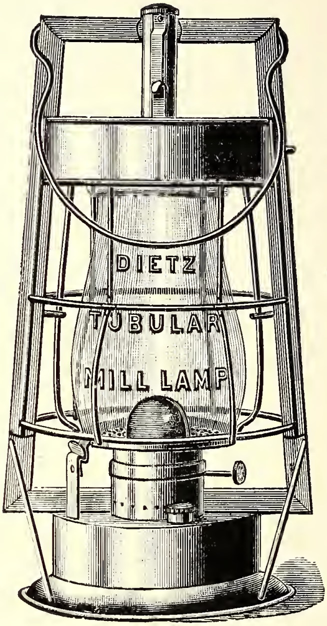
In almost every kind of manufacturing or mercantile business there are particular substances or processes which add to the fire hazard of the business and against which the best protection possible should be employed. In all factories, for instance, there is liable to be an accumulation of oily waste which, unless properly cared for, might easily ignite spontaneously and cause a bad fire. Waste should be kept in cans made for the purpose, and these cans should, preferably, be kept out of doors nights and holidays. In businesses requiring the use of benzine or similar volatile liquids, every care should be used in the handling of them; and none but safety cans, made for the purpose, should be employed. It is scarcely necessary to dilate upon the usefulness of metal ash cans, wire gas jet and spark guards, safety lanterns, etc. These should recommend themselves to every cautious business man.

SAFETY DEVICES.

Safety Cans for Oily Waste.—Made by John F. Pfeifer & Co., Philadelphia, Pa.

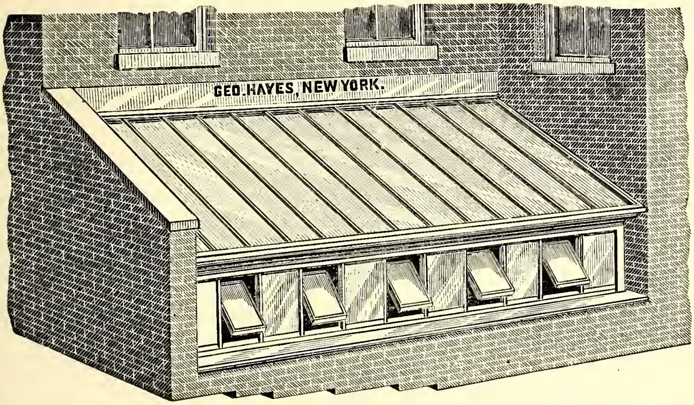
Safety Benzine Can.

Safety Cans for Benzine.—Made by—
F. Wesel Manufacturing Company, New York.
Golding & Company, Boston, Mass.
"Nacefas" Oil Cans.—Made by F. C. Wilson & Co., 239 Lake street, Chicago, Ill.

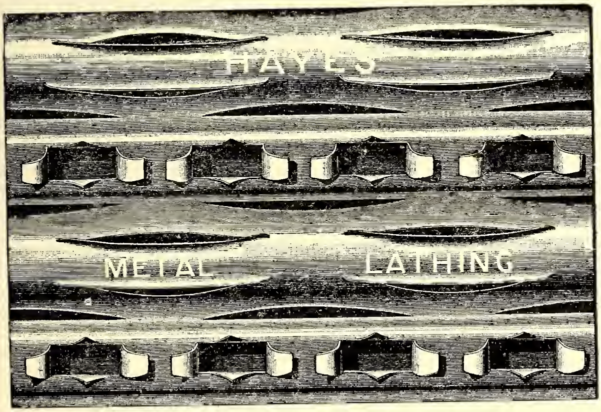


DIETZ TUBULAR MILL LAMP.

Safety Lamps and Lanterns.—Made by R. E. Dietz, New York.
Safety Cement and Varnish Cans.—Made by—
J. K. Kreig Company, New York.
F. W. Whitcher & Co., 4 High street, Boston, Mass.
Tin Kit Heaters.—Made by F. W. Whitcher & Co., 4 High street, Boston, Mass.
Explosion Preventors for Malt Mills.—Made by—
Anton Doebler & Sons, 335 W. Thirty-sixth street, New York.
Wagner & Marr, 413 North Howard street, Baltimore, Md.
Magnetic Separators for Malt Mills.—Made by Anton Doebler & Sons, 335 W. Thirty-sixth street, New York.
Barrel Heaters.—Made by—
Chambers' Patent Barrel Heater Company, St. Louis, Mo.
Hynson & Son, St. Louis, Mo.
Wire Window and Door Guards.—Made by—
G. A. Williams & Sons, 85 Fulton street, New York.
Wire Skylight Guards.
Wire Spark Arresters.
Made by Monarch Manufacturing Company, Indianapolis, Ind., and Dow Wire Works Company, Louisville, Ky.


GEO. HAYES, NEW YORK.

Ventilating Extension Skylight.



Metal Lathing.

Metal Skylights, Window Frames and Lathing.—Made by
Geo. Hayes, 71 Eighth avenue, New York.
Eagle Cornice & Skylight Works, 30 Sullivan street, New York.
Lefferts, Marshall & Co., 485 Cherry street, New York.

Box Anchors, Post Caps and Hangers.—Made by Goetz Box Anchor Company, New Albany, Ind.

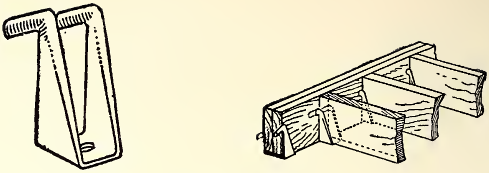
Self-Closing Oily Waste Cans.—Made by Chas. A. Allen, 35 Dey street, New York.

Hoe's Safety Patent Benzine Can.—Sold by Chas. A. Allen, 35 Dey street, New York.

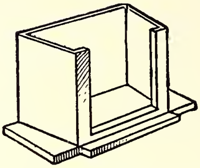
Dewey's Cold Blast Safety Lantern.
Dewey's Steel Mill Safety Lantern.
Dewey's Mill Safety Lantern.
Made by F. O. Dewey Company, 28 Canal street, Boston, Mass.

Galvanized Iron Ash Cans.—Made by Chas. A. Allen, 35 Dey street, New York.

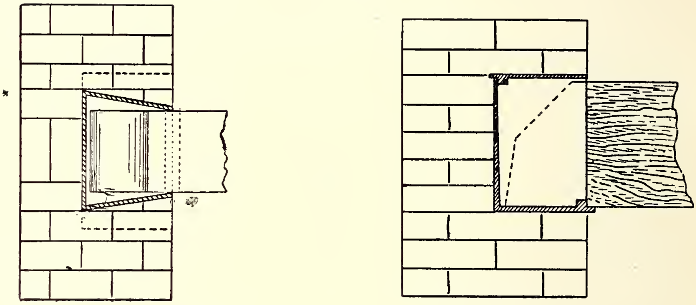
Spark Guards.—Made by Arthur Collins & Co., 343 W. Thirty-seventh street, New York.



Joist Hangers.



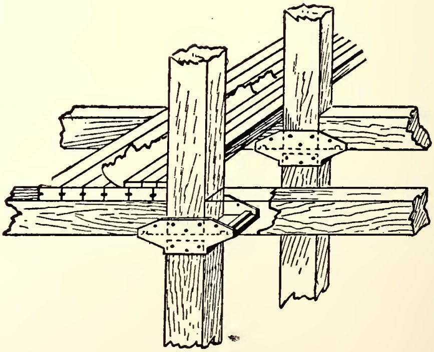
With Base Plate and
Air Space.



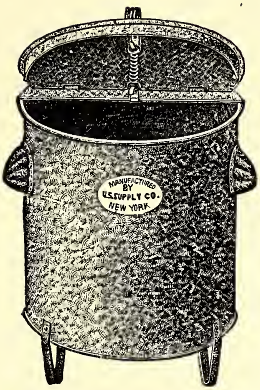
Showing Dove Tail
Bondage of Box
Anchor with Wall.

With Wall Plate.

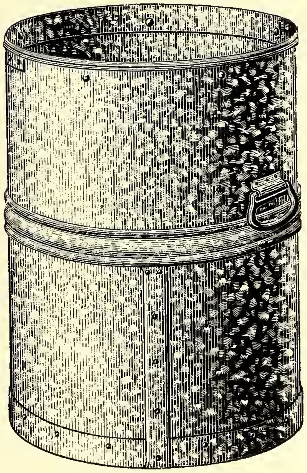
Box Anchors.



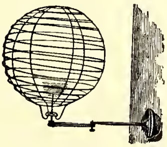
Post Caps.



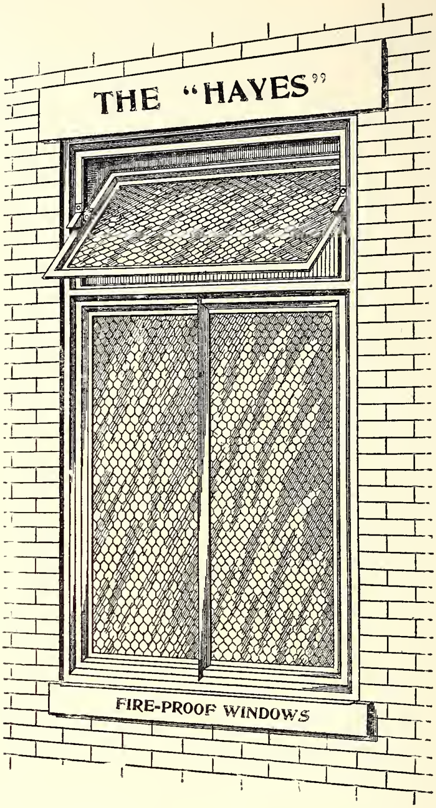
Self-Closing Oily Waste Can.



Metal Ash Can.



Wire Gas Jet
Guard.



FIREPROOF WINDOWS, METAL FRAMES AND WIRE-GLASS.

Gas Jet Wire Guard.—Made by Chas. A. Allen, 35 Dey street, New York.

Asbestos Cloth, Gloves, Fireproof Rope and Twine, Soldering Blocks and Household Articles.—Made by H. W. Johns Manufacturing Company, 100 William street, New York.

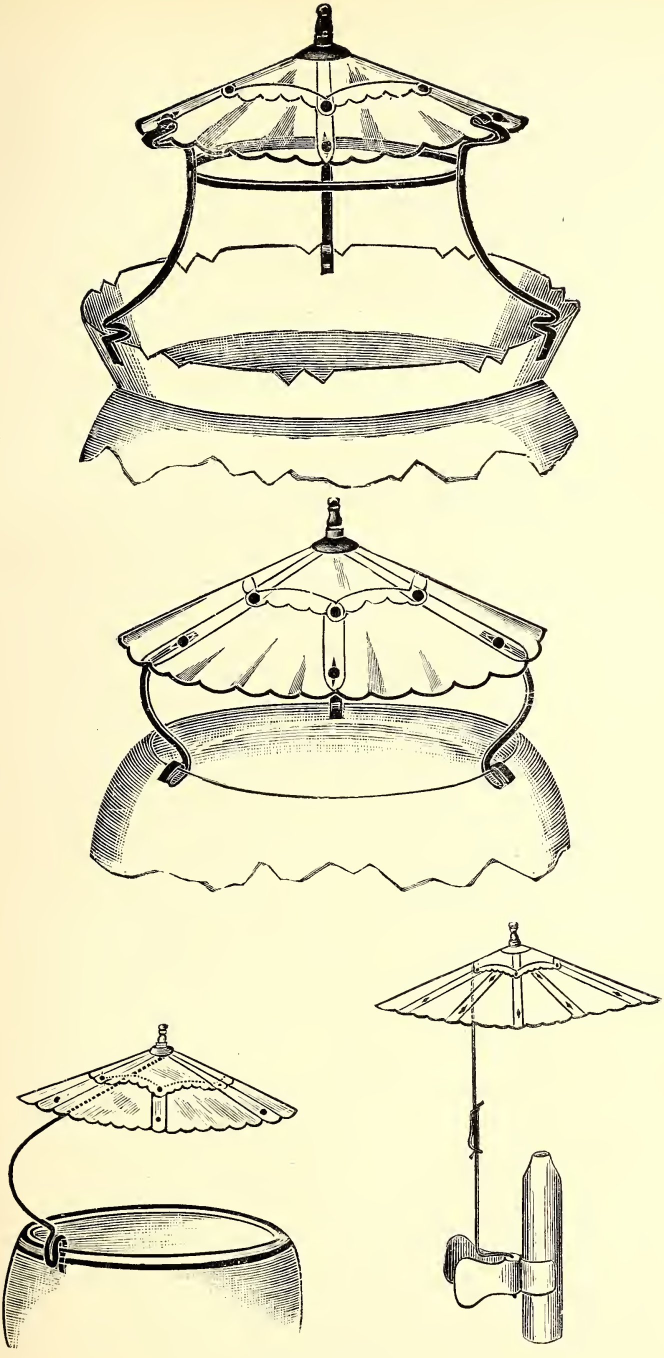
Lightning Rods.—Made by—
C. Johnson, 52 John street, New York.
J. P. Turner, 337 Fifteenth avenue, Paterson, N. J.
E. G. Washburn & Co., 46 Cortlandt street, New York.

Fuse Wire and Links.—Made by Jersey City Smelting Company, 105 Plymouth street, Jersey City, N. J.

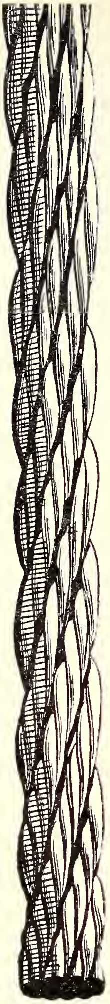
Standard Fuses.—Made by Chicago Fuse Wire & Manufacturing Company, 154 Lake street, Chicago, Ill.

Mica Canopies for Gas Globes.—Made by Mica Manufacturing Company, 88 Fulton street, New York.

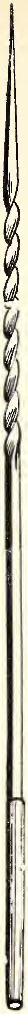
Mica Products.—Made by—
Palermo Mica Company, 27 Peck Slip, New York.
A. O. Schoonmaker, 158 William street, New York.
Mica Insulator Company, 218 Water street, New York.
Eugene Munsell & Co., 218 Water street, New York.



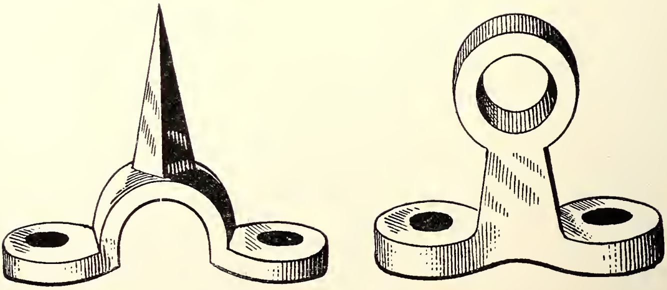
Mica Canopies.



28-Strand Copper Cable Lightning Rod.



Lightning Rod Point.



Lightning Rod Fasteners.

LIGHTING, HEATING AND COOKING APPLIANCES.

Numerous new devices in connection with the artificial lighting of buildings have been placed upon the market of late. Some of these are approved by underwriters and others are not. Before equipping a building with any new lighting system, it would be wise for the owner to consult an insurance agent in his vicinity in order to learn whether or not the system is approved. A Board of Consulting Engineers of the National Board of Fire Underwriters was appointed to take charge of the subject of lighting and heating equipments, but had promulgated no rules when this book went to press.

GASOLINE STOVES AND LAMPS

In the West, particularly, the use of gasoline for fuel has become quite extensive, and latterly it has also been growing in favor as an illuminant. Insurance companies had been rather chary about encouraging its use, but late in 1898 The Union (the controlling underwriters' organization in the Western States), removed practically all restrictions upon gasoline except those relative to its storage in quantity and filling lamps and stoves by daylight. While gasoline is explosive under certain conditions, under all other conditions it is practically as harmless as water. Gasoline vapor, mixed with just the proper quantity of air, is explosive; hence great care should be exercised to prevent the escape of vapor into rooms. As it becomes more generally and correctly understood, gasoline will gradually extend its field of usefulness.

Below will be found a list of gasoline machines and gasoline and kerosene stoves and lamps.

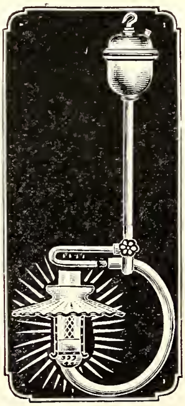
Airlight.—Incandescent Light & Stove Company, 422 East Pearl street, Cincinnati, Ohio.
Arc Vapor.—Arc Vapor Lighting Company.
Argand.
Aurora.
Backer's Brilliant.
Benbow Automatic.—Benbow-Reubel Mfg. & Novelty Company.
Best's Incandescent.—Best Street Light Company, Canton, Ohio.
Crown Jewel.
Dangler.
Economy Gas Lamp.—Economy Gas Lamp Company.
Front Rank.
Garland.
Gem Tropic.
Globe.
Home Comfort.—Home Comfort Lamp Company.
Housekeeper's Charm.
Housekeeper's Delight.
Housekeeper's Friend.
Imperial.—Imperial Gas Lamp Company.
Insurance (when fitted with Campbell's automatic cut-off or extinguisher.)
Jewel.
Jewel Junior (1894 pattern approved).
Jewel Process, No. 885.
Magic Lamp.—Magic Light Company, 15 River street, Chicago, Ill.
Manhattan.
Manhattan Junior (1894 pattern approved).
Monarch.
Monarch Junior (1895 pattern approved).
Moody Arc Vapor.—W. H. Moody Manufacturing Concern.
National.

National Junior (1894 pattern approved).
New Davis.
New Process.
New White Light.—N. W. L. Gas Lamp Company.
Omaha Automatic Gas Lamp.—Made by Omaha Automatic Gas Lamp Company, Omaha, Neb.
Peerless.
Peninsular.
Process (of the A. J. Lindemann & Hoverson Company).
Proskey Lamp.—Oil Vapor Incandescent Light Company, 70 Wall street, New York.
Quick Meal.
Quick Meal Junior (1894 pattern approved).
Regal Manhattan
Reliable.
Splendid.
Standard.—Standard Gas Lamp Company.
Sun Light.—International Lighting Company.
Superior Welsbach Hydro-Carbon Lamp.—Made by Ohio Illuminating Company, Mansfield, Ohio.
Thompson.—International Lighting Company.
Tropic.
Tropic Junior.
Washington Incandescent Light.—Burns refined coal oil vapor. Made by Washington Lighting Company, Cleveland, Ohio.
Kitson Hydro-Carbon Lighting System.

In addition to the makers of the above-named stoves and lamps, the following parties are engaged in that business:

Arc Vapor Lamp.—Sold by Irby & Gilland, 37 Union street, Memphis, Tenn.
E. Anton Gasoline Lamp & Fixture Company, 114 Olive street, St. Louis, Mo.
Metropolitan Daylight Lamp Company, Chicago, Ill.
Sunlight Gas Lamp Company, Chicago, Ill.

APPROVED GASOLINE LAMP.



BRILLIANT
INCANDESCENT
GAS LAMP.

The Brilliant Incandescent Gas Lamp's excellent qualities have given it a wide popularity. A single "Brilliant" light is the equivalent of one hundred candles, and will burn with one charge of gasoline for fifteen to twenty hours at a cost of about 2 cents. It produces a bright, intense, white light, which is as steady and pleasant as daylight and almost as cheap. The lamps are made in portable form and may be readily moved from room to room. They are excellently adapted for the home, hotel, factory or any public building. The lamp makes and burns its own gas, and produces light without smoke, smell or danger. Insurance companies approve and recognize the merits and popular demand for this lamp, and issue permits for its use without extra charge or increase of rates. Write for our descriptive price list.

Brilliant Gas Lamp Company, Chicago, Ill.

ACETYLENE GAS AND GENERATORS.

Although acetylene gas was known to chemists in the early part of this century, it is only within the past few years that an economical method of production has placed this illuminant within reach of people of moderate means.

The advent of calcium carbide in commercial quantities and at a price permitting a close competition with ordinary illuminating gas was quickly followed by experiments looking to its utilization. These in turn were succeeded by a large number of inventions designed for the purpose of generating, storing and burning the new gas, and applications for patents upon such devices were made almost daily.

A growing desire among property owners to avail of the new illuminant forced upon underwriters in various localities the necessity of studying its hazards with the double purpose of preventing accidents, as far as possible, and of properly adjusting premium rates for insurance to the altered conditions. This resulted in numerous sets of rules, which were considerably at variance with each other. Under these circumstances it was deemed wise for the National Board of Fire Underwriters to take the subject in hand, and this was accordingly done, the matter being placed in charge of the Committee on Lighting, Heating and Patents, for investigation. This committee and its sub-committee, with the assistants of experts, prepared general requirements for generators, and also rules for their installation and use. They are as follows:

NATIONAL BOARD RULES GOVERNING CONSTRUCTION OF STANDARD APPARATUS.

The use of liquid Acetylene or gas generated therefrom is absolutely prohibited.

The permission to generate and use Acetylene in insured premises shall be subject to the following rules:

APPARATUS.

It is desirable that all Acetylene Gas machines shall be installed outside of the building insured, but special permission may be granted in the discretion of tariff associations having jurisdiction to install machines inside the building under special circumstances, such permission to be given in writing, and shall be subject to the following rules:

1.—Must be made of iron or steel, and in a manner and of material to insure stability and durability.

2.—Must have sufficient carbide capacity to supply the full number of burners during the maximum lighting period.

Note.—This rule removes the necessity of recharging at improper hours. Burners almost invariably consume more gas than their rated capacity, and carbide is not of staple purity, therefore there should be an assurance of a sufficient quantity to last as long as light is needed. Another important feature is that in some establishments burners are called upon for a much longer period of lighting than in others, which requires a generator of greater gas-producing capacity.

3.—Must be uniform and automatically regulated in its action, producing gas only as immediate consumption demands, and so designed that gas is generated without excessive heating at all stages of the process.

Note.—This rule is necessary, because the presence of excessive heat tends to change the chemical character of the gas, and may even cause its ignition.

4.—Apparatus not requiring pressure regulators must be so arranged that the gas pressure cannot exceed thirty tenths inches water column (three inches).

5.—Must be provided with an escape pipe which will operate in case of the overproduction of gas, and also an attachment acting as an escape or relief in case of abnormal pressure in the machine, and which will carry such excess gas through an escape pipe of at least three-quarter-inch internal diameter to a suitable point outside of building, discharging at least twelve feet above ground level and provided with an approved hood.

Note.—Both the above safety vents may be connected with the same escape pipe.

6.—Apparatus requiring pressure regulator must be so arranged that the gas pressure can not exceed three pounds to the square inch. Such apparatus must be provided with additional safety blow-off attachment located between the pressure regulator and the service pipes and discharging to the outer air, the same as provided for in Rule 5.

Note.—This is intended to prevent the possibility of undue pressure of gas in the service pipe by failure of the pressure regulator.

7.—Must be so arranged that when being charged the back flow of gas from the holder will be automatically prevented, or so arranged that it is impossible to charge the apparatus without first closing the supply pipe to holder, or to other generating chambers, if any.

Note.—This is intended to prevent the dangerous escape of gas.

8.—Must be so arranged as to contain the minimum amount of air when first started or recharged, and no device or attachment facilitating or permitting mixture of air with the gas, prior to consumption, except at the burners, shall be allowed.

Note.—Owing to the explosive properties of Acetylene mixed with air, machines should be so designed that such mixtures are impossible.

9.—No valves or pet-cocks opening into the room from gas-holding part or parts, the draining of which will allow an escape of gas, shall be permitted; and the condensation from all parts of the apparatus must be automatically removed without the use of valves or mechanical working parts.

Note.—Such valves and pet-cocks are not essential; their presence increases the possibility of leakage. The automatic removal of condensation from the apparatus is essential to the safe working of the machine.

10.—The water supply to generator must be so arranged that gas will be generated long enough in advance of the exhaustion of the supply already in the gas-holder to allow of the using of all lights without exhausting such supply.

Note.—This provides for the continuous working of the apparatus under all conditions of water feed and carbide charge, and it obviates the extinction of lights through intermittent action of the machine.

11.—No carbide chamber of over twenty-five pounds capacity shall be allowed in any machine where water is introduced in small quantities or where the contact of water with carbide is intermittent.

Note.—This tends to reduce the danger of overheating and provides for the division of the carbide charges in machines of these types of large capacity.

12.—Generator must be connected with the gas-holder in such manner that it will, at all times, give open connection either to the gas-holder or to the blow-off pipe into the outer air.

NOTE.—This prevents dangerous pressure within or the escape of gas from generating chamber.

13.—Must be so designed that the residuum will not clog or affect the working of the machine and can conveniently be handled and removed.

14.—Covers to generators must be provided with secure fastenings to hold them properly in place, and those relying on a water seal must be submerged in at least twelve inches of water. Water seal chambers for covers depending on a water seal must be one and one-half inches wide and fifteen inches deep, excepting those depending upon the filling of the seal chambers for the generation of gas, where nine inches will be sufficient.

15.—Holder must be of sufficient capacity to contain all gas generated after all lights have been extinguished.

NOTE.—If the holder is too small and blows off frequently after lights are extinguished there is a waste of gas. This may suggest improper working of the apparatus and encourage tampering.

16.—The bell portion must be provided with a substantial guide to its upward movement, center guide preferred, and a stop acting about one inch above the blow-off point.

NOTE.—This tends to insure the proper action of the bell and decreases the liability of escaping gas.

17.—A space of at least three-quarters of an inch must be allowed between the sides of the tank and the bell.

18.—All water seals must be so arranged that the water level may be readily seen and maintained.

19.—Gas-holders constructed upon the gasometer principle must be so arranged that when the gas bell is filled to its maximum its lip or lower edge shall at all times be submerged in at least nine inches of water.

20.—The supply of water to the generator for generating purposes shall not be taken from the water seal of any gas-holder constructed on the gasometer principle.

NOTE.—This provides for the retention of the proper level of water in the generator.

21.—The apparatus shall be capable of withstanding fire from outside causes without falling apart or allowing the escape of gas in volume.

NOTE.—This prevents the use of joints in the apparatus relying entirely upon solder.

22.—Gage glasses, the breakage of which would allow escape of gas, shall not be permitted.

23.—Where purifiers are installed, they must conform to the general rules for the construction of other apparatus and allow the free passage of gas.

24.—The use of mercury seals is prohibited.

NOTE.—Mercury has been found unreliable as a seal in Acetylene apparatus.

25.—Construction must be such that liquid seals shall not become thickened by the deposit of lime or other foreign matter.

26.—Apparatus must be constructed so that accidental syphoning of the water is impossible.

27.—Flexible tubing, swing joints, packed unions, springs, chains. pulleys, stuffing boxes and lead or fusible piping must not be used on apparatus, except where the failure of the part will not vitally affect the working or the safety of the machine.

28.—There shall be plainly marked on each machine the maximum number of lights it is designed to supply and the amount of carbide necessary for a single charge.

To be approved, Acetylene Generators must conform to the foregoing standard, and plans and specifications in detail of such apparatus must be submitted to the insurance organization having jurisdiction over the territory in which such apparatus is to be installed, for approval by an inspector duly authorized by the .... Association, with whom a copy of such plans and specifications must be filed. If the plans are approved, a special examination of the generating apparatus will be made at the expense of the applicant, and if it is found to be in compliance with the standard, a certificate of approval will be issued.

CALCIUM CARBIDE.

1.—In no case shall calcium carbide be stored in bulk.

2.—Calcium carbide must be packed in screwed-top, water-tight metal packages, having all seams locked-jointed and soldered. They shall contain not over one hundred and twenty-five pounds of carbide, and each package must be conspicuously marked "Calcium Carbide, Keep Dry." The packages must be of sufficient strength to insure the handling of the same without rupture, and they must be kept under cover at all times.

FORM OF PERMIT FOR THE USE OF ACETYLENE GAS.

(The following permit is required in territory under jurisdiction of "The Union.")

In consideration of the following warranties on the part of the assured, permission is hereby granted to generate and use acetylene gas on the premises described in this policy, using a .... acetylene gas machine, manufactured by .... at ....when the same is installed in accordance with the rules printed on the back of this permit.

WARRANTED.

1.—That the generator shall be charged, and calcium carbide handled by daylight only.

2.—That no artificial light shall be permitted within ten (10) feet, and that no direct fire heat shall be permitted within fifteen (15) feet of the generator.

3.—That no calcium carbide, except in the generator, shall be kept in the building where this policy covers.

4.—That no greater than the equivalent of the number of half-foot burners for which the machine is rated, shall be installed.

5.—That no change be made in the installation without the approval and the written consent of this company indorsed thereon.

Attached to and forming a part of Policy No. .... of the .... Insurance Company, of.....................
.... Agents.

The use of liquid acetylene, or gas generated therefrom, on the premises described herein, is absolutely prohibited.

CAUTIONS.

1.—Calcium carbide should be kept in water-tight metal cans, by itself, outside of any insured building, under lock and key, and where it is not exposed to the weather.

2.—A regular time should be set aside for attending to and charging the apparatus during *daylight* hours only.

3.—In charging generating chambers clean all residuum carefully from the containers and remove it at once from the building. Separate the unexhausted carbide, if any, from the mass and return it to the container, adding new carbide as required. Be careful never to fill the container *over* the specified mark, as it is important to allow for the swelling of the carbide when it comes in contact with water. The proper *action* and *economy* of the machine is dependent on the arrangement and amount of carbide placed in the generator. Carefully guard against the escape of gas.

4.—Never add carbide to a partially exhausted charge, and never place carbide in the containers until all residuum and moisture have been removed.

5.—Never deposit the residuum or exhausted material in the sewer pipes, or near inflammable material.

6.—Water tanks and water seals must always be kept filled with clean water.

7.—*Never test the generator or piping for leaks with a flame, and never apply flame to piller cocks from which the burner has been removed.*

8.—*Never use a lighted match, lamp, candle, lantern, or any open light near the machine.*

RULES GOVERNING THE INSTALLATION OF ACETYLENE GENERATORS.

It is desirable that all acetylene generators shall be installed outside of insured buildings (see specifications, Rule No. 15), but special permission may be granted to install generators inside buildings where they are installed in conformity with the following rules and approved by the authorized representative of this company:

1.—Generators must be placed on substantial foundations and set perfectly level. Where practicable the foundations shall be of brick, stone, concrete or iron. If necessarily of wood, they shall be extra heavy, in a dry place and open to the circulation of air. The foundations must be such that unequal strain is not placed on the generator or connections.

Note.—The ordinary board platform commonly used is not satisfactory. Wooden foundations should be of heavy planking, joist or timber arranged so that the air will circulate around them and so as to form a firm base. Wood should not be used in the construction of the machine or to support the several parts.

2.—Generators must be placed where water in the same will not freeze. Where they are not intended for use throughout the entire year, all water and gas must be removed at the end of the season.

Note.—It is usually necessary to take the bell portion of the holder out so as to allow all gas to escape. This should never be done in the presence of artificial light or open fire of any kind.

3.—Generators to be placed preferably in a large well ventilated room. In no case must they be placed in closets or small rooms where artificial light is necessary. If inclosed the enclosure should be of slatted partitions permitting the free circulation of air. Rooms must have sufficient height to permit the free and full upward movement of the gas holder or moving parts.

4.—Generators to be placed where they can be easily adjusted and operating mechanism readily seen without artificial light, and in no case should they be placed so that their proper action can be easily interferred with by children or careless persons. Where possible, generators must be placed so as to be well lighted from windows.

5.—Generators should be placed at the greatest distance practicable from direct fire heat and artificial light. In no case should they be nearer than fifteen feet to direct fire heat, and in no case must they be nearer than ten feet to any gas jet, lamp, lantern or other source of artificial light.

6.—Each generator must be provided with an escape or relief pipe of at least three-quarter inch internal diameter. This pipe must be substantially installed, without traps, and so that any condensation will drain back to the generator. It must be carried to a suitable point outside and terminate in an approved hood located at least twelve feet above ground and remote from windows.

7.—The connection from generator to service pipes must be made so that any possible moisture in the pipes will drain back to the generator. Pet cocks for draining are not permitted.

Note.—A valve and by-pass connection should be provided from the service pipe to the blow-off for removing the gas from the holder in case it should be necessary to do so.

8.—The schedule of pipe sizes for piping from generator to burners should conform to that commonly used for ordinary gas, but in no case should the feeders be smaller than three-eighths of an inch. The following schedule is advocated.

⅜ inch pipe, 26 feet, three burners.
½ inch pipe, 30 feet, six burners.
¾ inch pipe, 50 feet, twenty burners.
1 inch pipe, 70 feet, thirty-five burners.
1¼ inch pipe, 100 feet, sixty burners.
1½ inch pipe, 150 feet, one hundred burners.
2 inch pipe, 200 feet, two hundred burners.
2½ inch pipe, 300 feet, three hundred burners.
3 inch pipe, 450 feet, four hundred and fifty burners.
3½ inch pipe, 500 feet, six hundred burners.
4 inch pipe, 600 feet, seven hundred and fifty burners.

The piping must be thoroughly tested both before and after burners have been installed. Piping should not show loss in excess of two inches within twelve hours when subjected to pressure equal to fifteen inches of mercury.

9.—Generators must be installed by persons experienced in the installation of acetylene apparatus. Each installation to be inspected by an authorized representative of this company before the permit is granted.

10.—Generators must be of sufficient capacity to furnish gas continuously for all lights supplied and for the maximum lighting period. They must be capable of supplying gas continuously for at least five hours, and for all burners attached.

Note.—Owing to the fact that most of the generators examined are found to be over rated and poorly proportioned for the service expected of them, great care should be taken to provide a machine large enough for all conditions of service and so that recharging at night can be avoided. The following ratings will usually be found advisable:

(a) For dwellings and where machines are always used intermittently, a generator rated to supply *all* of the burners attached should be used.

(b) For stores, opera houses, day run factories and similar service, the generator should have a capacity from thirty to fifty per cent in excess of the total capacity of the burners.

(c) For saloons, all night or continued service, generators having an excess capacity of from one to two hundred per cent over total capacity of burners are most always necessary.

A small generator should never be installed to supply a large number of lights, even though it seems probable that only a few lights will be used at a time.

AN OVERWORKED GENERATOR ADDS TO THE COST OF ACETYLENE.

11.—Carbide charges must be sufficient to furnish gas for all burners during the maximum lighting period. In determining the charges, the carbide to be estimated as containing four and one-half cubic feet to the pound and the burners as consuming at least 25 per cent over rated burning capacity.

Note.—Some manufacturers prefer to increase the carbide charge in order to supply the rated number of lights for a longer period than five hours. In such cases the generators must be cleaned and recharged at regular stated intervals, regardless of the number of lights actually burned.

12.—Burners consuming one-half of a cubic foot per hour are considered standard in rating generators. Those having a greater or less capacity will decrease or increase the number of burners allowable in proportion.

Note.—Burners usually consume from twenty-five to one hundred per cent more gas than their rated capacity, depending largely upon pressure. The one-half-foot burner (so-called) is usually used with best economy.

13.—Burning pressures should be from twenty to twenty-five tenths inches water column for best economy. The piping should be such that uniform pressure is furnished to all burners without overweighting the gas holder. (See Rule 8.)

14.—Portable acetylene apparatus for temporary, occasional, scientific, educational or experimental exhibitions may be permitted, providing it does not contain to exceed three pounds of calcium carbide and providing it complies with rules of installation.

SPECIFICATIONS FOR OUTSIDE GENERATOR HOUSE:

15.—(a) In closely built-up districts outside generator house to be of brick, fireproof, and located at least ten feet away from other buildings. Where the generator house does not open into or toward the building it may be placed close to it, providing the separation of ten feet be clearly impossible. In outlying districts where the generator house can be located twenty-five feet away from other buildings it need not to be of fireproof construction. (b) Dimensions to be confined to the requirements of the apparatus, allowing convenient room for re-charging and inspection of parts. Floor to be located at least twelve inches above grade. (c) To be heated by steam, hot water or hot air, care being taken to insure against freezing in the most severe weather. To be without artificial light and to be provided with a hooded ventilator in roof which can be opened and closed from the outside. (d) To be used exclusively for the apparatus or storage of calcium carbide when not in conflict with other rules, and to be kept under lock and key so as to prevent molestation.

Stringent regulations relating to the storage of calcium carbide have been adopted by underwriters in various localities, and mercantile houses handling this commodity should post themselves thoroughly as to the requirements in order not to vitiate their insurance.

It is claimed for acetylene gas that it gives the nearest approximation to sunlight yet available for practical use, and that color values are the same by its light as by daylight; that it gives more light with less heat than does the ordinary illuminating gas, and in doing so vitiates only one-hundredth as much air. The cost of acetylene light is estimated at less than one-half that of ordinary gas light, calculated on the basis of candle power hours. It is also claimed that there is really less danger attached to the use of dry acetylene gas than there is in connection with ordinary illuminating gas. Considering these numerous and weighty favorable features of acetylene gas, it is not surprising that a demand for generators has resulted in the invention of a liberal number of them, many of which are mentioned below:

Names of Generators.	Names and Addresses of Manufacturers.
Acetogen	F. Cortez Wilson & Co., 239 Lake street, Chicago, Ill.
Acme	Acme Generator Company, Chicago, Ill.
Aladdin	American Gas Light Company, St. Louis, Mo.
American	American Acetylene Gas Company, 504 Masonic Temple, Minneapolis, Minn.
Apollo	Electro Gas Lighting Company, Baltimore, Md.
Automatic Magazine	
Automatic Single Charge	Bryan Manufacturing Company.
Automatic Valveless or Vinkle	Lucas Brothers, Minneapolis, Minn.
Beacon	Pan-American Acetylene Company, 485 Ellicott square, Buffalo, N. Y.
Becklight	Acetylene Generator Manufacturing Company, Sixth and Vine streets, Cincinnati, Ohio.
Beucus	Beucus Gas Generator Company, Cedar Springs, Mich.
Bournonville	The General Acetylene Company, 56 University Place, New York.

Bruce	Bruce Generator Company, Karst & Breher, mfrs., 183 W. Third street, St. Paul, Minn.
Buckeye	Price Manufacturing Company, Freeport, Ohio.
Buffington	Buffington Gas Company, Boston Block, Minneapolis, Minn.
Cap Sheaf	Sawyer & Havens, Bellevue, Mich.
Castana	Castana Acetylene Gas Company, Castana, Ia.
Chicago	Kennedy & Seavey, Aurora, Ill.
Chicago Jewel	Monarch Manufacturing Company, 208 S. Pennsylvania street, Indianapolis, Ind.; Chicago Jewel Manufacturing Company, Syracuse, N. Y
Cleveland	Harris Manufacturing Company, Cleveland, O.
Climax	New Process Manufacturing Company.
Corona	Corona Gas Light Company, 219 S. Third street, Minneapolis, Minn.
Crown	Detroit Galvanizing & Sheet Metal Works, Detroit, Mich.
Daylight	Daylight Acetylene Gas Company, 126 Second street, Louisville, Ky.
Draper	Draper & Langslow, Dana, Ind.
Duplex Automatic	Electro Gas Lighting Company, Baltimore, Md.
Eclipse	Eclipse Manufacturing Company, 269 Dearborn street, Chicago, Ill.
Economic	Hugh Partridge.
Ellicott	Pan-American Acetylene Company, 485 Ellicott square, Buffalo, N. Y.
Emansee	Modica & Carroll Company, Chicago, Ill.
Epworth	Epworth Gas Light & Heating Company, Waterloo, Ia.
Eureka	F. W. Arney & Company, patentees; Dr. R. M. Hollingsworth, lessee and manager, Terre Haute, Ind.
Favorite	F. O. McQueen Manufacturing Company, Scottsburg, Ind.
Fierce Daylight	J. C. Charbeneau & Company, Mt. Clemens, Mich.
Hanford	Samuel Hanford.
Happy Thought	Guelph Acetylene Gas Generator Company, Ltd., Guelph, Ont., Canada.
Harger	Jenks & Son, Prairie City, Ia.
Harris	Harris-Hart Company, Chicago, Ill.
Hennessey	American Incandescent Gas Company, Kansas City, Mo.
Holmes	Holmes-Bailey Acetylene Gas Company, Manton, Mich.
Hull	J. M. Hull, Atchison, Kan.
Indiana	General Acetylene Supply Company, Kansas City, Mo.
International Solar	United Acetylene Machine Company.
Iowa	Hartung & Ellwood, Cedar Rapids, Ia.
Kennedy	J. E. Kennedy, Caledonia, Mich.
Kohinoor	Western Acetylene Light Company, 200 Jersey street, Quincy, Ill.
Kopf	M. B. Wheeler Electric Company, Grand Rapids, Mich.
Lancaster	Jas. H. Lancaster, 95 Liberty street, New York.
Laun	Laun Brothers, 763 W. Sixty-third street, Chicago, Ill.
Leader	Sarran Manufacturing Company, Cincinnati, O.
Leckband Giant	T. H. J. Leckband, Adair, Ia.
Leede	Solar Acetylene Gas Co., Minneapolis, Minn.
Lewis	Lewis Gas Machine Company.
Liberty Center	Liberty Center Gas Company, Liberty Center, O.
Light of the World	Standard Gas Machine Company.

Little Giant	W. R. Stokes, 1527 E. Lake street, Minneapolis, Minn.
Lone Star	Lone Star Acetylene Gas Company.
Lowenstine's	Lowenstine Gas Generating Co., Valparaiso, Ind.
Marquette	Missouri Manufacturing Co., St. Louis, Mo.
Martindale	Kinnear Manufacturing Co., Ltd., Warren, Pa.
Miller's Improved	William Miller.
Monarch	Monarch Acetylene Gas Company, 1022 Douglas street, Omaha, Neb.
Mulhern	Adair Gas Company, Adair, Ia.
National	National Acetylene Gas Company, 909 New England Building, Cleveland, Ohio.
National	Buffalo National Acetylene Gas Company, 420 Ellicott square, Buffalo, N. Y.
National Sunlight	National Sunlight Gas Company, Ryan Block, Davenport, Ia.
Niagara Falls	Niagara Falls Acetylene Gas Machine Company, Ltd., Niagara Falls, N. Y., and Niagara Falls, Canada.
Northlight	Pan-American Acetylene Company, 485 Ellicott square, Buffalo, N. Y.
No Valve	T. H. J. Leckband, Adair, Ia.
O'Herron	Daugherty & O'Herron, Princeton, Ind.
Ontario	Ontario Acetylene Gas Machine Company.
Ordway	National Acetylene Gas Generator Company, 45 Bridge street, Corning, N. Y., and 460 Jackson street, St. Paul, Minn.
Owen	Geo. F. Owen Company, Grand Rapids, Mich.
Patterson	Patterson Generator Company, Batavia, N. Y.; Monroe Foundry & Furnace Company, Monroe, Mich.; Norwalk Foundry & Machine Company, Norwalk, Ohio; Patterson Acetylene Gas Machine Company, Le Roy, Ohio.
Perfection	Charles Wyllie.
Premier	Premier Acetylene Generator Company, 161 Superior street, Chicago, Ill.
Rex	Rex Acetylene Generator Company.
Reynolds	Powers & Reynolds, Nashville, Mich.
Rochester	Rochester Acetylene Generator Company, 145 S. St. Paul street, Rochester, N. Y.
Ross	Ross Manufacturing Company, Lafayette, Ind.
Rush	J. K. Rush, Canandaigua, N. Y.
Scantlin	Scantlin & Bailey Manufacturing Company, Lafayette, Ind.
Schwarz Perfection Burner	E. P. Gleason Manufacturing Company, 20 W. Houston street, Manhattan, N. Y.
Security	Holt Bros. & Rose, 905 S. Twentieth street, Omaha, Neb.
Shafer	Shafer Acetylene Gas Generator Company, Rose Dispensary Building, Terre Haute, Ind.
Shakopee Valveless	Shakopee Generator Company, Shakopee, Minn.
Simplex	Simplex Gas Machine Company, Clark, S. D.
Simplex Solar	The General Acetylene Company, 56 University Place, New York.
Sperry's Automatic	S. L. Sperry, Hebron, Neb.
Star	Star Acetylene Gas Company, St. Paul, Minn.
Stover	Frank E. Stover.
Strahle Automatic	Strahle Generator Company, Stanton, Neb.
Submarine	Sunlight Gas Machine Company.
Sun	F. W. Preussel, Mt. Clemens, Mich.
Sunlight Automatic	Acetylene Gas Machine Company.
Tanner	Tanner & Drake, Cleveland, Ohio.

Taylor	Taylor Acetylene Gas Company, 3 E. Fourteenth street, New York, and 103 Western avenue, Minneapolis, Minn.
Triumph	Craig-Reynolds Foundry Company, Dayton, O.
Turner	Turner & Hauser, 121 Ottawa street, Grand Rapids, Mich.
Unique	J. W. Thorne.
Venus	Western Acetylene Works, Plainfield, Ill.
Wing's	Manhattan Machinery Company, 109 Liberty street, New York.
Yancey	Yancey & Dussel.
	Alexander Furnace & Manufacturing Company, Lansing, Mich.
	J. A. Brown, Mitchell, S. D.
	Carbolite Construction Company, Chicago, Ill.
	R. J. Eger, Bay City, Mich.
	The Human Gas Company, Denver, Col.
	W. F. Laudenschlager, New Ulm, Minn.
	Shour Bros. Manufacturing Co., Chillicothe, Mo.
	Western Actylene Gas Company, Chicago, Ill.
	Boston National Acetylene Gas Company, 17 State street, Boston, Mass.

ACETYLENE STOVES.

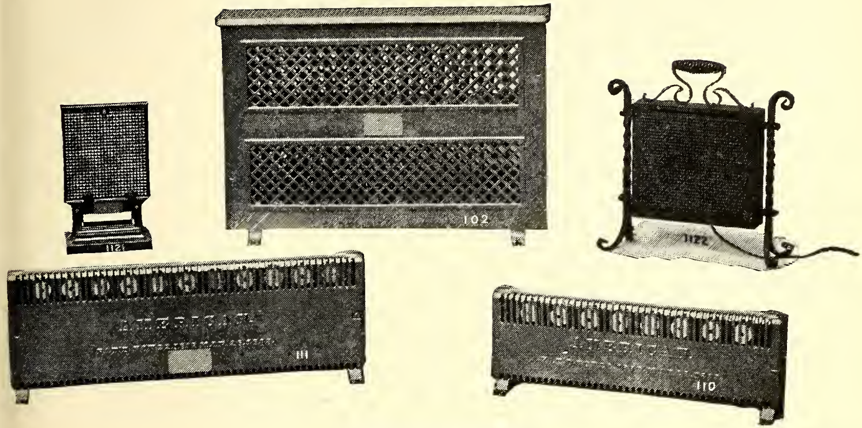
Made by Acetylene Gas Illuminating Company, 105 Walker street, New York.

CARBIDE OF CALCIUM.

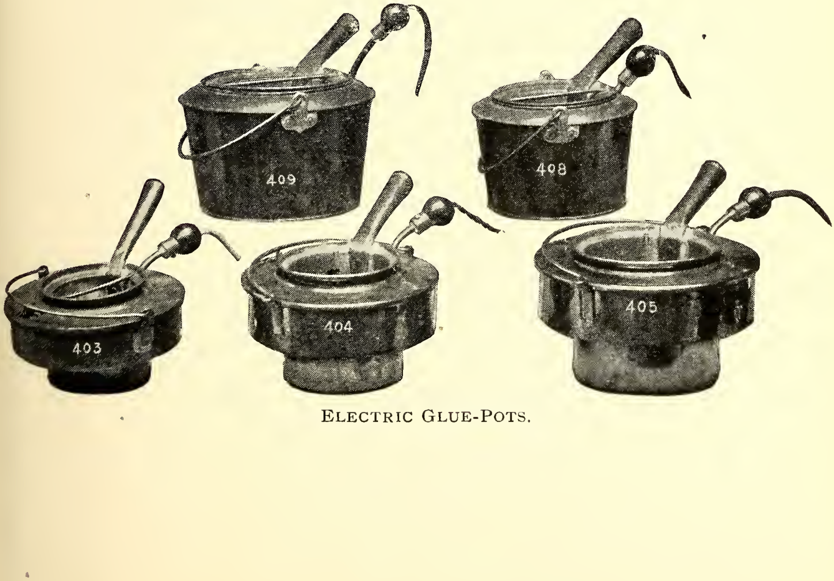
Carbide of Calcium, the basis of Acetylene Gas, is manufactured by the Union Carbide Company, 45 Broadway, New York, and 157 Michigan avenue, Chicago, Ill.

ELECTRIC HEATING AND COOKING GOODS.

Made by Simplex Electrical Company, Cambridgeport, Mass.



Electric Heaters.



Electric Glue-Pots.

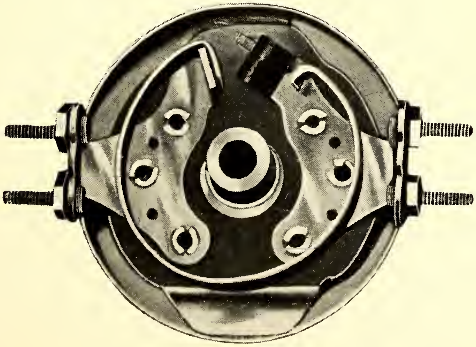
FIRE ALARMS AND WATCHMEN'S CLOCKS.

Many and diverse methods of giving alarm of fire obtained from early times to the present. In this country the most common have been bells, whistles, steel triangles and wheel tires, mainly operated by hand. There have been great improvements along this line, and the modern automatic systems report the existence and location of fire much more quickly and certainly than is possible, generally speaking, with a watchman and an old-fashioned alarm. Nevertheless, the latter are not to be despised, and are particularly adapted to some combinations of place and circumstances.

In order to insure faithful attention to duty on the part of watchmen, clocks have come into use which are mechanically or electrically operated, and which record each visit of the watchman to particular parts of the building under guard. These watchmen's clocks have proved very efficient in securing the best service from those left in charge of buildings nights and holidays.

AUTOMATIC ALARMS.

Various devices for the automatic transmission of fire alarms are now in use. These are usually operated either directly by the action of heat upon thermostats or by the passage of water through sprinkler pipes. By means of such alarms necessary appliances are promptly brought to the scene of a fire, which may thus be checked in its incipiency and damage arising from the excessive flow of water from sprinklers is averted.



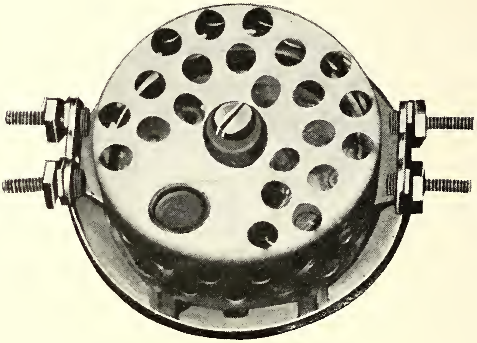
Watkins Thermostat—Cover Off.

A large number of automatic alarms are now upon the market, including the following:

LIST OF AUTOMATIC FIRE ALARMS.

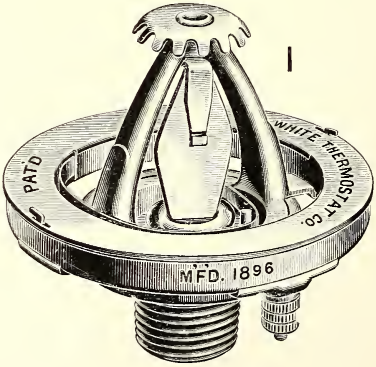
American Fire Alarm.—Made by National Fire Appliance Company, 77 Kilby street, Boston, Mass.

Mercurial and Fusible Thermostats; Recording Test Apparatus.—Made by R. F. Hersey, 145 High street, Boston, Mass.



Watkins Thermostat—Cover On.

Watkins Automatic Fire Alarm.—Made by Automatic Fire Alarm Company, 416 Broadway, New York.



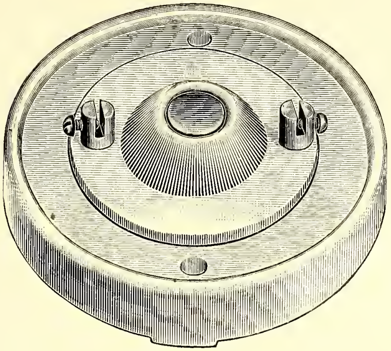
Combination of Thermostat and Grinnell Sprinkler.

White Automatic Fire alarm (plain or in combination with Grinnell Sprinkler).

Wall's Thermostat.

Sprinkler Alarm Valve Circuit Tester.

Made by Geo. A. Wall, Providence, R. I.



THE WALL THERMOSTAT.

Bradley Automatic Fire Alarm.—Made at 188 State street, Boston, Mass.

Gamewell Auxiliary Fire Alarm.—Made by Gamewell Fire Alarm & Telegraph Company, 19 Barclay street, New York.

Boston Automatic Fire Alarm.—Made by Boston Automatic Fire Alarm Company, 104 Milk street, Boston, Mass.

Pneumatic Fire Alarm.—Made by United Pneumatic Fire Alarm Telegraph Company, 876 Broadway, New York.

Push Button Fire Alarm.—John E. White, agent and manufacturer, 92 Fifth avenue, New York.

Montauk Fire Detecting Wires and Cables.—Manufactured by Montauk Multiphase Cable Company, 100 Broadway, New York.

IF AT EVERY POINT of every electrical conductor in your house a thermostat was placed you would have a reasonable assurance of immediate warning at the outbreak of fire.

IF ALL THE WIRES throughout your house can, without in any way affecting their efficiency, be made to respond to dangerous heat by the automatic ringing of alarm bells, the assurance of warning would be even more reasonable.

IF FURTHER, a strand of such fire-detecting wire was led around and over the well-known "danger lines" of your home, especially about the basement and cellar and where combustible materials are stored, the assurance would be almost absolute.

YOUR ELECTRICIAN can make all your electrical connections with a wire, every point of which is a self-contained fire detector. By making the further extensions suggested your home can be rendered well nigh fireproof.

MR. JOSEPH PULITZER'S ELECTRICIAN wrote after the sensational conflagration of Jan. 9: "The warning automatically given by the Montauk Cable was the first intimation that the sleeping inmates received. * * * * Had the cellar and basement been protected as were the reception rooms, I feel convinced that the fire would never have gained headway of consequence." Mrs. Pulitzer herself has written: "I have such confidence in the Cable that, although now, temporarily, in a rented house, I have had it put in."

MANY FIRES are caused by poor installation or insulation of electrical conductors. If with all such conductors were installed companion fire detectors all such fires would be of insignificant consequence.

ORDINARY THERMOSTATS properly installed are of value. Their value, however, can be enhanced many fold by connecting them with fire-detecting wires and extending same to locations where thermostats themselves are not practicable.

A fire-detecting wire in the immediate vicinity of flame will give an alarm considerably before the temperature of the room is raised to the thermostat alarm point.

"FIRE-DETECTING WIRE" MEANS MUCH.—That a piece of wire or cable can, itself, at every infinitesimal point be rendered delicately sensitive to flame or dangerous heat, is another of the valuable applications of electricity.

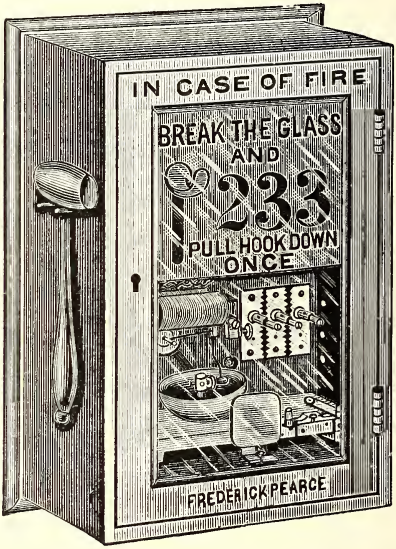
REELS OF FIRE-DETECTING WIRE can be easily and cheaply placed upon the walls of storehouses and at night the wire led over the piles of inflammable material. No better application of electricity can be contemplated. Properly connecting the reel terminals to an annunciator would give a fire protection positively positive.

THE RENDERING of every point of ordinary electrical conductors into fire detectors is the accomplishment of Montauk Multiphase Cable. The detective feature is added in detail, interfering in no way with the efficiency of the conductor for its primary service.

TO PROTECT LIFE IS TO SAVE LIFE.—No greater protective device has yet been constructed than the fire detecting wire, manufactured and sold under the trade name of Montauk Multiphase Cable. Multiphase because of its many utilities as an electrical conductor.

THE NATURAL LAW that heat WILL expand metal affords a positiveness to its action that is invaluable.

Rogers Auxiliary Fire Alarm.—Made by Auxiliary Fire Alarm Company, Ames Building, Boston, Mass.



Special Fire Alarm Electrical Signal.

Special Fire Alarm Electrical Signal.—Made by Special Fire Alarm Electrical Signal Company, 20 Rose street, New York.

Gamewell Fire Telegraph (Gamewell Auxiliary Fire Alarm System).—Furnished by the Gamewell Fire Alarm Telegraph Company and the Gamewell Auxiliary Fire Alarm Company, 19 Barclay street, New York.

McMahon Automatic System.—Made by J. P. McMahon, 279 Fourth street, Jersey City, N. J.

OTHER FIRE ALARM MANUFACTURERS.

Protective Automatic Fire Alarm Company, Cincinnati, Ohio.

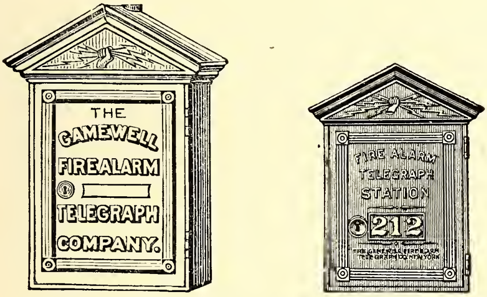
Western Electric Company, Chicago, Ill.

Boston Automatic Fire Alarm Company, 104 Milk street, Boston, Mass.

National Fire Appliance Company, 77 Kilby street, Boston, Mass.
New York Thermostatic Fire Alarm Company, 415 Broadway, New York.
Ludlow Automatic Fire Alarm Company, Cincinnati, Ohio.
Manhattan Fire Alarm Company, 19 Barclay street, New York.
Einbigler & Adler, 430 Seventh avenue, New York.
American Watchman's Time Detector Company, 234-235 Broadway, New York.

THE GAMEWELL FIRE ALARM TELEGRAPH COMPANY.

It is only within the last fifty years that the electric fire alarm has come into being, the first having made its appearance in Boston in 1851 at the suggestion of Dr. W. F. Channing, who, with the co-operation of Moses G. Farmer, installed the original system and operated it for some years. In 1855 John N. Gamewell secured their patent rights for the South, and later, in 1859, obtained them for the entire country. After the war John N. Gamewell & Co., and subsequently the Gamewell Fire Alarm Telegraph Company, began active operations in pushing the business throughout the country. Not until 1869 did they succeed in providing New York city with a system, strange as it may seem that the metropolis should have been so slow to recognize its merits. Up to 1871 only about twenty cities had availed of the fire alarm apparatus, but from then to now the growth of favorable sentiment has been more rapid. Now there are comparatively few cities of 5000 or more inhabitants which are not provided with a fire alarm telegraph service, while many more have an adequate telegraphic equipment. Mr. Gamewell and his successors have supplied more than ninety per cent of the fire alarm apparatus now in use in the United States and Canada.



GAMEWELL FIRE ALARM TELEGRAPH STATIONS.

In 1869 Joseph W. Stover became general agent for the Gamewell Company, and has been its president for the last twenty years.

While the essential features of the original devices remain in use, a great many changes and improvements have been made in mechanical details.

A strong point in favor of the use of the Gamewell appliances is that in its entire history neither the Gamewell Company nor any of its customers have ever been compelled to abandon the use of any devices furnished by it.

The equipment required for a small town is very simple and inexpensive, including a number of alarm boxes, a single telegraph circuit and an apparatus which strikes a given number of blows upon a bell or blows a series of blasts upon a whistle, according to the location of the signal box from which the alarm is given. In larger towns the same system may be used, but somewhat elaborated, requiring more than one circuit and sometimes needing a central station.

The Auxiliary Fire Alarm System provides a plan of sending in an alarm from any part of any building within the territory covered by street signal boxes. This is done by connecting the interior boxes with the nearest street box, which conveys an alarm directly from the endangered premises to the fire engine houses, etc. The latest improvement in this direction is made possible by the use of the Montauk Multiphase Cable, by which the fire itself sends the alarm, this cable being so constructed that when attacked at any point by fire it gives notice at the station with which it is connected.

Anyone owning property or interested in municipal alarms should communicate with the Gamewell Company in order to secure the surest protection.

The following general rules concerning thermostatic equipments have been adopted by the National Fire Protection Association for the guidance of boards of underwriters having rules and rate-making powers, and will doubtless come to be accepted as the standard for this class of devices.

GENERAL RULES AND REQUIREMENTS FOR THE INSTALLATION OF WIRING AND APPARATUS FOR AUTOMATIC FIRE ALARMS, HATCH CLOSERS, SPRINKLER ALARMS, AND OTHER AUTOMATIC ALARM SYSTEMS AND THEIR MANUAL AUXILIARIES.

1. Wires Inside Buildings.

(a) Must be equivalent in conductivity and tensile strength to No. 16 B. & S. copper wire.

(b) Must have an approved insulated covering. (Note.—In permanently damp places a solid rubber covering at least 3-64 inch in thickness, covered with a substantial braid, will be required. For open work in dry places, a filled braided covering at least 1-32 inch in thickness will be required. For moulding and tubing a rubber or filled braided covering at least 1-32 inch in thickness will be required. Samples of all cables should be submitted to the inspection department having jurisdiction before being installed.)

(c) Unless encased in approved tubing or thoroughly filled moulding must, except as hereinafter provided, be run in plain sight and supported entirely on non-combustible insulators placed not more than 8 feet apart and so arranged that the insulating covering of the conductors will come in contact with no other substances than the designed support, the protecting bushings and the connecting instruments.

(d) Must be protected from abrasion and from accidental contact with other conductors. (Note.—Substantial boxing or iron conduits must be used on side walls. Wires should be run over rather than under all pipes, and their coverings must be separated from contact with all pipes by a solid insulating substance creating a separation of at least ½ inch. Special attention must be paid to the mechanical execution of the work. Careful and neat running, taping of wires and attaching and securing of fittings is required.)

(e) Must be installed as far as practicable without joints. Where joints are necessary they must be mechanically and electrically secure and covered with an insulation equal to that on the conductors.

(f) Must in bay construction follow contour of ceiling and not be strung from beam to beam. In joisted construction they must run parallel with joists or else have a 4-inch wide wood backing strip with knobs or cleats fastened to the bottom of this strip.

(g) Must, where exposed to mechanical injury, between battery, transmitter, testing apparatus, annunciator, and gong (if any) on outside of risk, be inclosed in boxing, moulding or iron conduit.

(h) Must, when passing through iron, brick, stone or any damp partition, or through any floor, be protected by approved bushing. (Note.—Glass and porcelain are approved for bushings. Where, from the nature of the case, it is impossible to use glass or porcelain, approved flexible conduit—such as circular loom—may be used. Except where cables are used, wires of opposite polarity to be run through separate bushings.

(i) Where wires enter building, they must be bushed, have drip loops, and be kept at least 6 inches apart.

2. Wires Outside Buildings.

(a) Must be equivalent in conductivity and tensile strength to No. 12 galvanized iron wire.

(b) Must have an approved insulating covering. (Note.—For aerial wires a good weatherproof covering consisting of a thoroughly saturated and filled braided covering at least 1-32 inch in thickness, will be approved. Samples of all cables used for underground construction should be submitted to the inspection department having jurisdiction.)

(c) Aerial wires must be provided near the point of entrance to the building with an approved heavy current protector.

(d) Aerial wires must be supported entirely on glass or porcelain petticoat insulators, at least every 150 feet, and run as far as possible over rather than under electric light or power wires.

(e) Wires of opposite polarity to be run on separate insulators, and to be kept at least 12 inches apart.

3. Thermostats for Automatic Alarms.

(a) Must be placed throughout premises, including inside of all closets, in basements, lofts, elevator wells and under stairs. Special instructions must be obtained relative to placing them under large shelves, decks, benches, tables, overhead storage racks and platforms, and inside small inclosures, such as drying and heating boxes, caul boxes, tenter and dry room inclosures, chutes and cupboards. No portion of the premises shall be accepted without the written consent of the inspection department having jurisdiction.

(b) Must never be farther from walls and partitions than one-half the distance between thermostats in the same direction.

(c) Under smooth ceilings must not be at a greater distance than 12 feet in either direction.

(d) Under open joisted ceilings they shall not be at a greater distance than 10 feet in either direction; but when bays are formed by timbers, 8 to 12 feet from center to center, supporting the joists, a line shall be placed as near as possible in the center of the bay, the distance between thermostats at right angle to joists not being greater than 10 feet. Thermostats shall be placed at the bottom of joists.

(e) Under mill ceilings there must be a line as near as possible in the center of each bay. In 8-foot bays or over, thermostats to be not more than 10 feet apart. In bays under 8 feet, not over 12 feet apart. (Note.—Floors supported by timbers 5 feet or over from center to center will be considered "mill construction;" where timbers are less than 5 feet from center to center, "joist construction.")

NOTE—Sections (*c*), (*d*) and (*e*) of Rule No. 3 may be modified by insurance organizations having jurisdiction, for buildings not equipped with automatic sprinklers and for buildings equipped with automatic sprinklers if provided with a satisfactory alarm valve service.

(f) Must be supported in all cases independently of their attachment to the wires, except when cleats or knobs are within one foot of each side of thermostat.

(g) Must be marked with the minimum temperature they are designed to operate at in water. High-test thermostats for use in permanently warm places should have some characteristic marking, which can be easily distinguished after the instruments are installed.

4. Thermostats for Hatch Closers Must Be Placed.

(a) At the top of the elevator well or hoistway equipped, and

(b) On the ceiling below each floor opening, in such numbers and so arranged in each case as may be determined by the inspection department having jurisdiction.

5. Manual Alarms.

Used as auxiliaries to automatic alarm systems must be located near all main and at each floor exit, also a hand switch manual alarm near test box for testing purposes.

6. Batteries.

(a) Must be located in a cool, dry place as near as possible to annunciator, transmitter and testing apparatus.
(b) Must not be subjected to excessive changes in temperature.
(c) Must be inclosed to prevent mechanical injury; but be easily accessible for inspection.
(d) Dry batteries will not be approved.

7. Annunciator or Indicator.

(a) Must be located on outside of all risks equipped, in an accessible place where it will be readily seen by firemen responding to an alarm.
(b) Must have an index for each floor, and where floors are subdivided by fire walls, for each section of floor.
(c) Must not be installed where it will be subjected to severe jarring.
(d) Must be so arranged that indexes can be easily reset by hand.

8. Automatic Alarm Systems Operating Without Central Stations.

Inside Wires.

(a) When an open circuit, system must be so arranged that one break will not disable fire alarm.
(b) When on closed circuit, system must be so arranged that break will give an immediate and continuous alarm. This alarm must be distinct from fire alarm.
(c) When part of outside closed circuit, must not be less in size than No. 16 B. & S., and have an approved insulation, be supported entirely on porcelain knobs or cleats, independent of all inside circuit wires or cables, and, where subject to mechanical injury, be protected by mechanical boxing, leaving an air space around wires.
(d) Must nominally test free from all grounds.
(e) Wires of the outside closed circuit to be kept at least 2 inches apart.

Outside Wires.

(a) When on open circuit, system must be so arranged that a single break outside building will not disable more than one outside connection.
(b) When on closed circuit, system must be so arranged that a break will give an immediate and continuous alarm. This alarm must be distinct from fire alarm. System must be so arranged that on notification by this alarm, a ground may be thrown on at principal outside connection and system then be in working order.
(c) When on closed circuit system with large number of risks with common outside connection, must be arranged on the loop system with not more than 12 risks on any one loop.

Outside Connections.

Must have two outside connections from every risk equipped.

These connections should be chosen from the following, choice being made in the order given:

First—Fire department house within 2,500 feet, having permanent men and horses stationed therein. (Note—In certain large cities, the above connection alone will be required.)

Second—Fire department house within 2,500 feet, having "bunkers" and horses at nights.

Third—House of engineer or fireman of risk when same is within 1,200 feet.

Fourth—House of owner or superintendent of risk when same is within 1,200 feet.

Fifth—House of chief engineer or foreman of local fire department when either is within 1,200 feet.

Sixth—House of regular employee, other than those above mentioned, when same is within 1,200 feet.

When it is impossible to obtain any of the above, special instructions shall be obtained from the inspection department having jurisdiction.

Connection to city or town fire alarm box is not allowable.

Gongs.

(a) Must be either vibrating bells or of the electro-mechanical type.

(b) When vibrating bells are used, all bells must be of the regular vibrating pattern (not single stroke), and the system must be so arranged that the failure of any one bell to vibrate can in no way interfere with the proper giving of alarm at other points. Where additional bells, not called for by "rules" are installed, they may be of the single stroke pattern.

(c) A not less than 6-inch weatherproof gong shall be located on the outside of each risk equipped, placed as near as possible to (preferably "over") annunciator.

(d) A not less than 6-inch gong shall be placed at each outside connection.

(e) Where several risks run to a common outside connection with outside wiring on open circuit, there must be a separate indicating vibrating bell for each risk, the various circuits being kept entirely independent of each other.

(f) Where several risks run to a common outside connection with outside wiring on a closed circuit with electro-mechanical gong striking numbers, the gong shall have an annunciator showing numbers, a tell-tale to show how far gong is run down, and when it is desired to have some arrangement for cutting gong out of circuit, an indicating switch showing plainly whether gong is in or out of circuit.

Transmitters.

(a) Must be inclosed in a dustproof case and securely locked; clock-work to be wound from outside of case. Must be located near testing apparatus.

Relays.

(a) Must be located in a dustproof case.

(b) Must have a spring knife-edge contact point in addition to the ordinary relay contact.

(c) Where more than one relay is needed, independent relays must be used.

Testing Apparatus.

(a) When all wires of system are not under constant battery test, there shall be a testing apparatus located inside the risk as near as possible to annunciator. Entire test to be made daily, by operation of mechanism which, after test is completed, shall automatically leave system in normal condition, or else give a continuous trouble alarm.

(b) Shall record on dials continuity of all inside and outside open circuits, and shall ring all open circuit bells, a proper record not being obtained when any of these are out of order; shall also throw indexes of annunciator. Weakening of batteries shall prevent the recording on dials before it has progressed sufficiently to impair fire alarm.

(c) Where outside closed circuit system with transmitter and electro-mechanical gongs are used, there must be a test of transmitter, outside circuit and gongs at least once a week. This test shall be made by closing the manual alarm switch at risk, and a record of test shall be kept at fire department house. There shall be a system of ground detectors at fire department house which may be used to determine whether the outside closed circuit system is grounded.

ADDITIONAL RULES RELATING TO BOARD SUPERVISION.

Note—All thermostat systems installed must have received the written approval of the board having jurisdiction.

No changes in approved apparatus or system shall be made without the written approval of said board.

Extension of installation in any risk, due to changes in construction, must receive the inspection and approval of said board.

Thermostats set to operate above 155 degrees, test being made with thermostat immersed in water, will be considered high-test thermostats.

NON-AUTOMATIC FIRE ALARMS.

Alarm Bells.—Made by Williams' Bell Foundry, 107 Plymouth street, Jersey City, N. J.

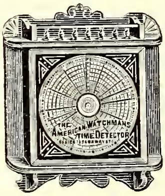
Anchor Electro-Mechanical Gongs.—Made by Anchor Electric Company, 71 Federal street, Boston, Mass.

WATCHMAN'S CLOCKS.

If a night watchman actually attends to his duty properly there is very little danger of fire at night in any risk, and this is recognized by the Fire Insurance Board, by making a concession in rate for night watchmen, only where an approved clock is used.

For a long time electrical clocks have been preferred by the insurance authorities, and the American Watchman's Time Detector Company's system as installed by them with specially made material and Magneto Generators at the station, secures the highest indorsement.

This clock is made under the patents of J. S. Morse, president of the company, and not only cannot be tampered with, but is afforded at a price that puts it in the reach of any establishment employing night watchmen, and they keep it in order for seven years, so that there is no longer occasion to use the mechanical clocks, which are always susceptible to manipulation by the watchman.


THE AMERICAN WATCHMANS TIME DETECTOR

American Watchman's Time Detector.—Made by American Watchman's Time Detector Company, 234 and 235 Broadway, New York.

Eco-Magneto Watchman's Clock.—Made by Eco-Magneto Clock Company, 620 Atlantic avenue, Boston, Mass.

Howard Electric Watchman's Clock.—Made by E. Howard Watch & Clock Company, 383 Washington street, Boston, Mass.

Sanford's Improved Watchman's Register.—Made by C. E. Sanford, 18 Broadway, New York.

Newman Mechanical.

Newman Electric.

Made by Newman Clock Company, 169 Wabash ave., Chicago, Ill.

Hahn's Improved Watchman's Clock.—Nanz & Co., 127 Duane street, New York.

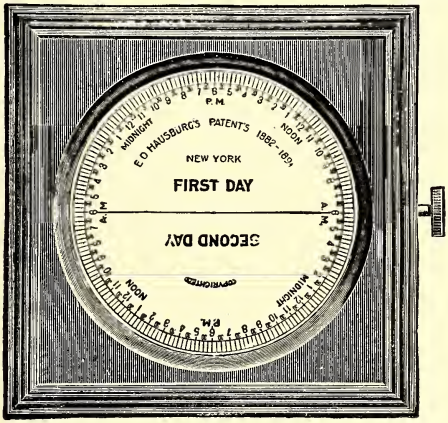
Pneumatic.—Made by Pneumatic Watchman Check Company, Columbus, Ohio.

Watchman's Time Recorder.—Made by Hersey Manufacturing Company, E. and Second streets, South Boston, Mass.

Redding Register.

Iona Magneto Watchman's Register.—Made by Anchor Electric Company, 71 Federal street, Boston, Mass.

The Hausburg Stationary Watchman's Clock.



THE ALERT.

Alert Electric Watchman's Register.—Made by E. O. Hausburg, 41 Maiden Lane, New York.

Chicago Automatic Time Recorder.—Made by Chicago Time Register Company, 189 Broadway, New York.

Time Recorders.—Made by—

National Magneto Time Detector Company, 14 Barclay street, New York.

Bundy Manufacturing Company, St. James Building, New York.

Herman Time Detector Company, Youngstown, Ohio.

International Time Recording Company, Jersey City, N. J.

WATCHMAN'S WATCHES.

Buerk's Watchman's Time Detector.—Made by J. E. Buerk, 230 Washington street, Boston, Mass.

Imhauser.—Made by E. Imhauser, 206 Broadway, New York.

Portable Watchman's Clocks.—Made by Newman Clock Company, 169 Wabash avenue, Chicago, Ill.

Hausburg Portable Watchman's Clock.

Excelsior.

Made by E. O. Hausburg, 41 Maiden Lane, New York.

OTHER WATCHMAN'S WATCH MANUFACTURERS.

American Watchman's Time Detector Company, 234 and 235 Broadway, New York.

FIRE EXTINGUISHING APPLIANCES AND WATER SUPPLIES.

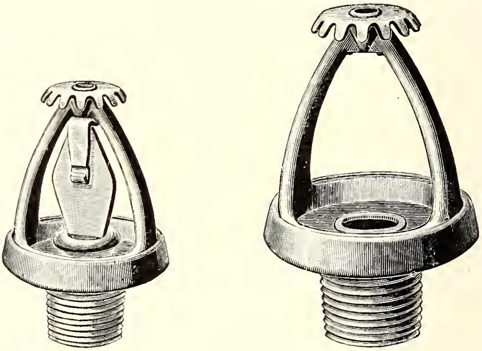
This chapter will deal only with such fire extinguishing appliances as are or may be used in mercantile and manufacturing establishments, and will not touch in any way upon the public fire service.

Extinguishing devices may be divided into two general classes, namely: automatic and non-automatic. The former class includes automatic sprinklers and their attendant devices, such as valves and pumps. Automatic sprinklers may be sub-divided into two classes, those distributing water and those distributing carbonic acid gas. The non-automatic class covers pails, hose, chemical extinguishers, etc., and sub-automatic extinguishing appliances. Chief among automatic devices is the automatic sprinkler. This, in its present state, is the development of many years of experimenting, the original sprinkler having been simply a pipe perforated at regular intervals, through which water could be forced in time of fire, and which would thus sprinkle the portion of the room or roof above which it was fixed. This was not automatic in any sense, but was a forerunner of the subsequent idea of automatic protection. A perforated pipe is still used to some extent, mainly as a protection for the exterior of buildings, being placed along the ridge of the roof or under the eaves. In the latter position, with a good supply of water, it would afford considerable protection as a water curtain. The first automatic sprinklers made were naturally defective in many ways, as viewed from the standpoint of present efficiency. They were made of metals which were found after a period of use to have become corroded to such a degree that the sprinklers would in many cases have refused to operate in event of fire. It was thereupon found necessary to devise some means of preventing corrosion, especially in factories where acids of various kinds were in use and their fumes would injuriously affect the metals in the sprinklers. This difficulty has been overcome by the use of such materials as glass and mica, and the sprinklers now in use have demonstrated their practicability by extinguishing many thousand incipient fires. When undertaking the installation of a sprinkler equipment, the importance of protecting every portion of the building should not be overlooked. If a small room or closet should be neglected a fire might easily gain such headway that the sprinklers elsewhere would be unable to cope with it. Bear in mind that all that can be expected of sprinklers is for them to extinguish a fire in its incipiency. Therefore, every portion of the building should be thoroughly protected by them. Again, sprinklers without a sufficient water supply are about as useless as no sprinklers, hence it is important that a constant and sufficient supply of water should be arranged for. For this purpose it is better to have two sources of supply if possible, as for instance, a large tank and a direct connection with the city water supply; then, in event of failure of one source of supply, the other could be called upon, or the city supply could be used to supplement the tank supply when the latter became exhausted.

In the construction of a building all concealed spaces should be avoided. The construction should be such that water from sprinklers can penetrate to every portion of the woodwork, and, in general, sprinklers should be so placed that water from them would reach every portion of the premises. The rules covering the installation of the sprinkler systems by the plan of the Underwriters Association of the Middle Department will be found elsewhere in this book. A list of the manufacturers of the sprinklers, valves, fittings, pumps, tanks, etc., which are used in the installation of the sprinkling equipment is presented below:

AUTOMATIC SPRINKLERS.

Grinnell Sprinklers.
Neracher Sprinklers.
Grinnell Cornice Sprinklers.
Grinnell Valves.

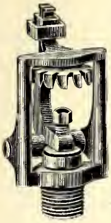


Closed (⅓ size). Open (½ size).

GRINNELL AUTOMATIC SPRINKLER.

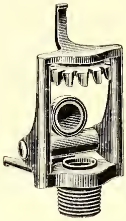
Made by General Fire Extinguisher Company, Providence, R. I.

Esty.—Made by Esty Sprinkler Company, Laconia, N. H.
Hibbard Sprinklers and Valves.—Made by National Fire Extinguisher Company, New York Life Building, Chicago, Ill.
Independent (or Stantial).—Made by Independent Fire Sprinkler Company, Chicago, Ill.
John Kane
International.
International Eave.
International Alarm Valves.
Universal.—Made by International Sprinkler Company, 110 South Orianna street, Philadelphia, Pa.
Walworth.—Made by Walworth Manufacturing Co., Boston, Mass.



Upright
Sprinkler
Closed.

The Walworth Sprinkler is accepted and approved by all insurance companies, and where installed, lowest rates are secured. . . . . . .



Upright
Sprinkler
Open.

The Walworth Automatic Link Sprinklers were first introduced nearly twenty years ago, and, with few exceptions, all the original equipments are still in service, securing for policyholders as low rates of insurance as could be had by current installation.

The Walworth Sprinklers as now constructed are practically the same as those first made, whereas the construction of other sprinklers has been frequently changed in order to overcome deficiencies which the lapse of time has developed.

The fusible portions of the Walworth Sprinkler, upon whose efficiency the value of the equipment depends, may be readily examined and replaced, without the system being put out of service for an instant. To replace the fuses of other sprinklers it is necessary to remove them from the pipes.

It is claimed for the Walworth that it is less liable to corrosion than is any other sprinkler on the market.

The danger of accidental opening of Walworth Sprinklers is guarded against by means of a "safety link" which fits outside of the one which holds the valve closed and which would hold the lever in position should the inner seal become ruptured. As the outer link fuses at a lower temperature than does the inner one, the efficiency of the sprinkler is not impaired at all by its presence.

After a fire, a Walworth system can be immediately placed in working order again, thus giving uninterrupted protection.

The Walworth Sprinkler is tight under all water pressures.

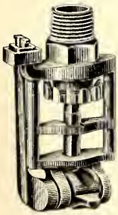
The deflector being at some distance from the outlet, the discharge of water is considerably larger than is that of some other sprinklers under the same conditions.

As the fusible metal is above the water outlet, there is no danger of the water cooling the solder. The liability to breakage is lessened by reason of the soldered link being placed above the frame of the Sprinkler.

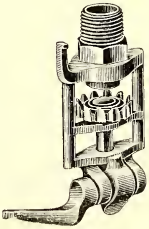
When considering the installation of a Wet or Dry Pipe Sprinkler System, consult the

WALWORTH MFG. CO.

14 to 28 Oliver St., Boston, Mass.
141 Park Row Bldg , New York City



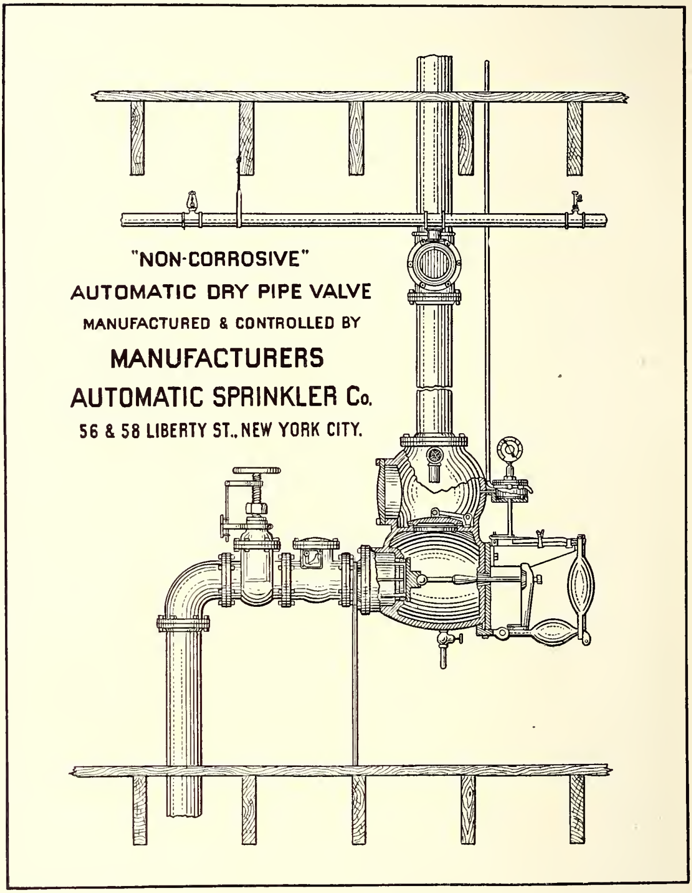
Pendant
Sprinkler
Closed.



Pendant
Sprinkler
Open.

Jahn Sprinklers and Valves.—Made by Standard Equipment Company, 198 Montague street, Brooklyn, N. Y.

Babcock.—Made by Fire Extinguisher Mfg. Co., Chicago, Ill.



Manufacturers' (Non-Corrosive) Sprinklers and Valves.—Made by Manufacturers' Automatic Sprinkler Company; Factory, Syracuse, N. Y.; Executive Offices, 56 Liberty street, New York.

WATER SUPPLIES.

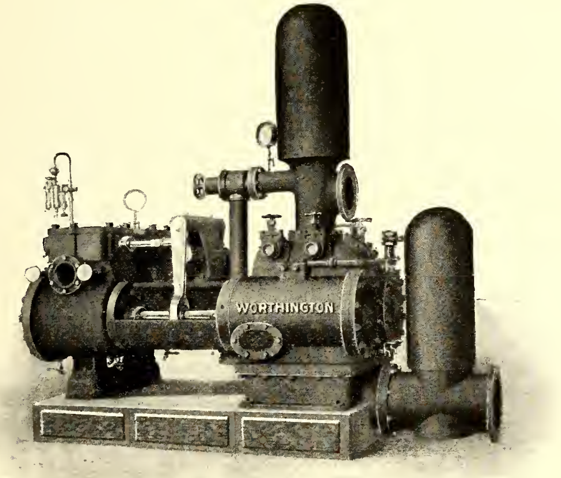
It is always unwise to depend, for protective purposes, upon a single source for water supply if it is possible to have more than one. The underwriters much prefer two independent supplies for sprinkler systems, one to furnish water automatically and the other to supply it under heavy pressure.

Specifications have been adopted by the National Fire Protection Association for cast iron, tar-coated water pipe. When installing a water system, first make certain by referring to a local insurance man that the system as planned will comply in all respects with the requirements of the underwriters.

The water furnished automatically should be sufficient in volume and force to give effective results promptly on the opening of one or more sprinklers, as the element of time in the subjugation of fire is of the utmost importance. The supplementary supply should be ample in quantity, sufficient to enable the pump to run at its rated capacity for at least an hour. Following will be found lists of fire and rotary pumps and manufacturers:

FIRE PUMPS.

Knowles' Underwriter.
Knowles' Duplex.
Made by Knowles' Steam Pump Works, 93 Liberty st., New York.
Blake Duplex.—Made by Geo. F. Blake Manufacturing Company, 111 Federal street, Boston, Mass.
Worthington Underwriter Fire Pump.



WORTHINGTON "UNDERWRITER" FIRE-PUMP.

Worthington Duplex.
Worthington Electric Fire Pump.
Made by Henry R. Worthington, Brooklyn, N. Y.
Snow Underwriter.
Snow Duplex Fire Pump.
Made by Snow Pump Company, Buffalo, N. Y.
Smith-Vaile Underwriter Fire pump.
Smith-Vaile Electric Pump.
Smith-Vaile Duplex.—Made by Stilwell-Bierce & Smith-Vaile Company, Dayton, Ohio.
Piston Steam Pump.—Made by American Fire Engine Company, Seneca Falls, N. Y.
Gould's Triplex.—Made by Gould's Mfg. Co., Seneca Falls, N. Y.

Deane Duplex Underwriter Fire Pump.
Deane Triple Expansion Duplex.
Deane Duplex Fire Pump.
Made by Deane Steam Pump Company, Holyoke, Mass.
Underwriter Fire Pump.—Made by Barr Pumping Engine Company, Philadelphia, Pa.
Valley Underwriter Fire Pump.—Made by Springfield Elevator & Pump Company, Springfield, Mass.
Duplex.—Made by Canton Pump Company, Canton, Ohio.

ROTARY FIRE PUMPS.

Crocker.—Made by E. D. Jones & Sons' Co., Pittsfield, Mass.
Fales & Jenks.—Made by Fales & Jenks' Machine Company, Pawtucket, R. I.
Gould.—Made by Gould Manufacturing Co., Seneca Falls, N. Y.
Holly.—Made by Holly Manufacturing Company, Lockport, N. Y.
Holyoke.—Made by Holyoke Machine Company, Holyoke, Mass.
Humphrey.—Made by Humphrey Machine Company, Keene, N. H.
Rodney Hunt Underwriter.—Made by Rodney Hunt Machine Company, Orange, Mass.
Rumsey.—Made by Rumsey & Co., Seneca Falls, N. Y.
Silsby.—Made by American Fire Engine Co., Seneca Falls, N. Y.
Roots' Rotary.—Made by P. H. & F. M. Roots Company, 109 Liberty street, New York.
Twin Rotary.
None Such.
Made by Clark Machine Company, Turner's Falls, Mass.
Rife Hydraulic Engine.—Made by Power Specialty Company, 126 Liberty street, New York.

TANKS.

Elevated gravity tanks are required to be placed well above the roof line of a building equipped with sprinklers, in order that the highest line of sprinklers may be adequately supplied. The bottom of the tank should be at least 15 feet above the highest sprinklers, and the tank must have a capacity of not less than 5000 gallons. An independent pipe must be used for filling, and provision must be made to prevent freezing, either by means of a steam coil or otherwise. A tell-tale and a permanent ladder or stairway must be maintained. Piping must be properly packed and enclosed to avoid freezing.

An air pressure tank should be placed in the top story of the equipped premises, and its capacitv must be proportioned to the size of the plant. It must be kept two-thirds full of water and an air pressure maintained (not under 75 pounds) which will show a pressure on the highest line of sprinklers when the water has all been discharged, of not less than 15 pounds.

PRESSURE TANKS AND STAND-PIPES.

TANKS.

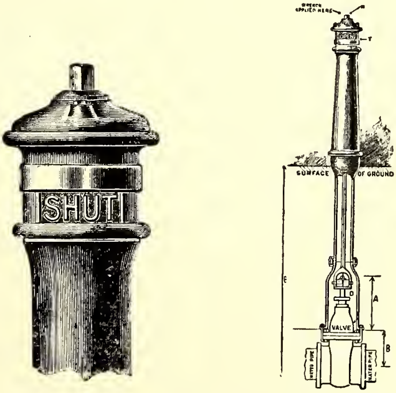
Since 1864 Messrs. E. Hodge & Co., of East Boston, Mass., have been engaged in boiler construction, and in recent years have also taken up the manufacture of standpipes, pressure and other tanks. This firm had ample facilities for turning out plate iron work of any character or dimensions, precisely according to specifications. It has given entire satisfaction to a large number of customers, particularly in New England, the Middle States and the South (to whom intending buyers may refer), but is not adverse to gaining new friends. Communications from municipalities or private parties contemplating the purchase of goods of the above description will receive prompt and courteous attention. Prices will be found as reasonable as is consistent with first-class work and material.

Made by E. Hodge & Co., East Boston, Mass.
James Russell Boiler Works Company, South Boston, Mass.

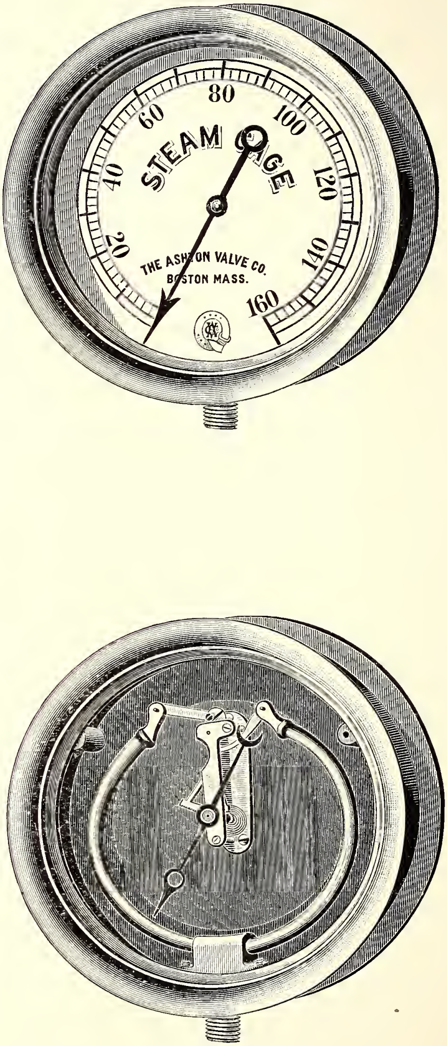
VALVES, GAUGES, ETC.

When installing a sprinkler or other water system for the extinguishment of fire, it is necessary to use valves, gauges, telltales and similar mechanisms which shall be satisfactory to and have the approval of the underwriters in the locality of the equipped plant. This is not only desirable in order to secure the lowest insurance rates, but for the best protection of the owner. Manufacturers of these goods are named below:

Beats All Pump Governor and Reducing Valve.
Locke Automatic Safety Shut-Off Valve.
Check Valves, etc.
  Made by Locke Regulator Company, Salem, Mass.
Ashton Water Relief Valve, Standard Underwriter Pattern.
Ashton Patent Steam Gauge.
Ashton Combination Water Pressure Gauges.
  Made by Ashton Valve Co., 271 Franklin street, Boston, Mass.
Consolidated Water Relief Valve.—Made by Consolidated Safety Valve Company, 111 Liberty street, New York.
Hydrants.
Bronze Hose Valves.
Indicator Valves.
Tell-Tale Valve Posts.
  Made by Ludlow Manufacturing Company, Troy, N. Y.
American Safety Valve.—Made by American Steam Gauge Company, 35 Dey street, New York.
Mathews' Patent Fire Hydrants.
Eddy Valves.—Made by Eddy Valve Company, Waterford, N. Y.

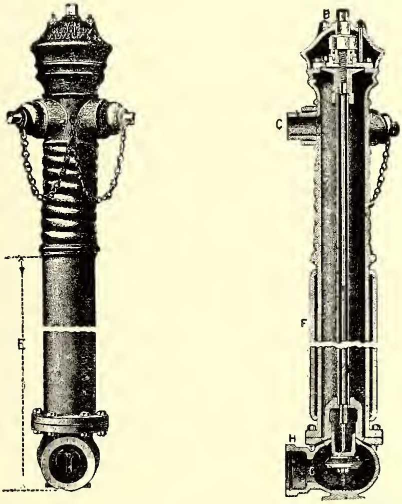


KENNEDY VALVE INDICATOR POST.

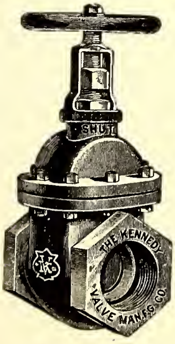

STEAM GAGE
THE ASHTON VALVE CO.
BOSTON MASS.

Steam Gauge

Indicator Valve Posts.
Made by R. D. Wood & Co., 400 Chestnut street, Philadelphia, Pa.
Neu's Electrical Tell-Tale Floats.
Neu's Automatic Check and Alarm Valves.
Made by G. S. Neu, 145 Center street, New York.
Crosby Pressure Gauge.—"Underwriter."
Crosby Water Relief Valves ("Underwriter" and "Standard").
Crosby Safe Water Gauges.
Made by Crosby Steam Gauge & Valve Company, 78 John street, New York.
Edson Steam-Pressure Recording and Alarm Gauge.—Made by Ashcroft Manufacturing Company, 111 Liberty street, New York.
Composition Hose Valves.
Kennedy's Patent Fire and Indicator Valves.



KENNEDY STANDARD COMPRESSION FIRE HYDRANT


SHUT
THE KENNEDY VALVE MANFG. CO.

SPECIAL FIRE OR
INDICATOR VALVE.

IRON BODY
WATER GATE

Kennedy Gate Fire Hydrant.
Kennedy Compression Fire Hydrant.
Kennedy Outside Screw and Yoke Indicator Valve.
Kennedy Patent Valve Indicator Post.
Made by Kennedy Valve Co., 57 Beekman street, New York.

OTHER MANUFACTURERS OF VALVES, GAUGES, ETC.

Bristol's Company, Waterbury, Conn.
J. B. Edson, 87 Liberty street, New York.
S. P. Jones, 28 School street, Boston.
Adams & Smith, 62 Gold street, New York.
Crane Company, 122 Center street, New York.
Dry Safety Valve Company, 19 Whitehall street, New York.
Golden Gate Mfg. Co., 546 W. Twenty-third street, New York.
A. A. Griffing Iron Company, 66 Center street, New York.
Jenkins Brothers, 71 John street, New York.
Kelly & Jones Company, 104 John street, New York.
Mackay Manufacturing Company, 211 Water street, New York.
Mayer & Loewenstein, 164 Water street, New York.
New York Belting & Packing Co., 25 Park place, New York.
T. G. Oakes, 52 John street, New York.
C. S. Ogden & Co., 52 Ferry street, New York.
St. John Cylinder Packing Co., 108 Fulton street, New York.
John Simmons' Company, 106 Center street, New York.
Vulcanized Fibre Company, 14 Dey street, New York.
Chapman Valve Manufacturing Company, Boston, Mass.
Eddy Valve Company, Waterford, N. Y.

RULES GOVERNING SPRINKLER EQUIPMENTS.

The following rules to govern the installation of automatic sprinkler systems were adopted by the Underwriters Association of the Middle Department, and are substantially identical with those adopted by underwriters throughout the country.

Cardinal Principles.—An automatic sprinkler is a device for distributing water, having a valve arranged to open by action of heat, as from a fire which it is intended to extinguish.

The underlying principles of automatic sprinkler protection are:—

First.—Sprinklers throughout.—No unprotected portions.

Second.—The providing of an ample water supply always in service.

Third.—Buildings must be open in construction, free from concealed spaces or places where water thrown from sprinklers cannot penetrate.

Fourth.—Sprinklers to be so located that their distribution will cover all parts of the premises.

Fifth.—Sprinkler piping to be of sufficient capacity, and to have water under pressure in same at all times, except in case of buildings where there is danger of water freezing. (See dry-pipe system.)

Sixth.—A supply of water of sufficient quantity and pressure available at all times.

Note.—All the above essential conditions should be complied with to obtain proper automatic sprinkler protection.

LOCATION AND ARRANGEMENT OF SPRINKLERS.

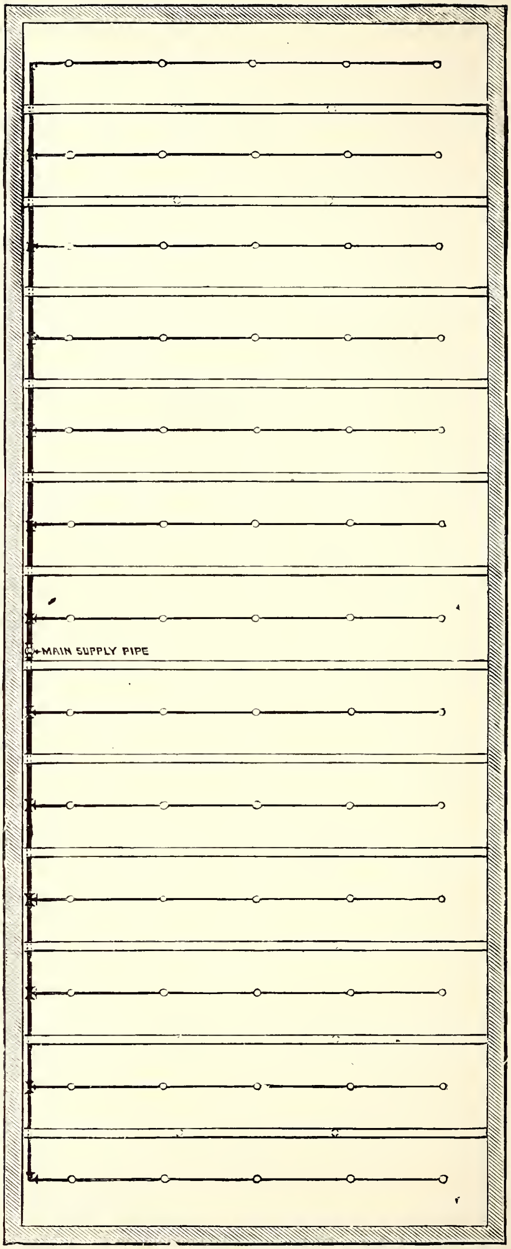
1. Sprinklers should be located preferably in an upright position on top of pipes, and must be so placed in connection with dry pipe system. (See Article 69.)

2. In all cases deflectors must be *parallel to ceilings*, roofs or the incline of stairs. (The deflectors of sprinklers in the peak of a pitch roof to be horizontal.)

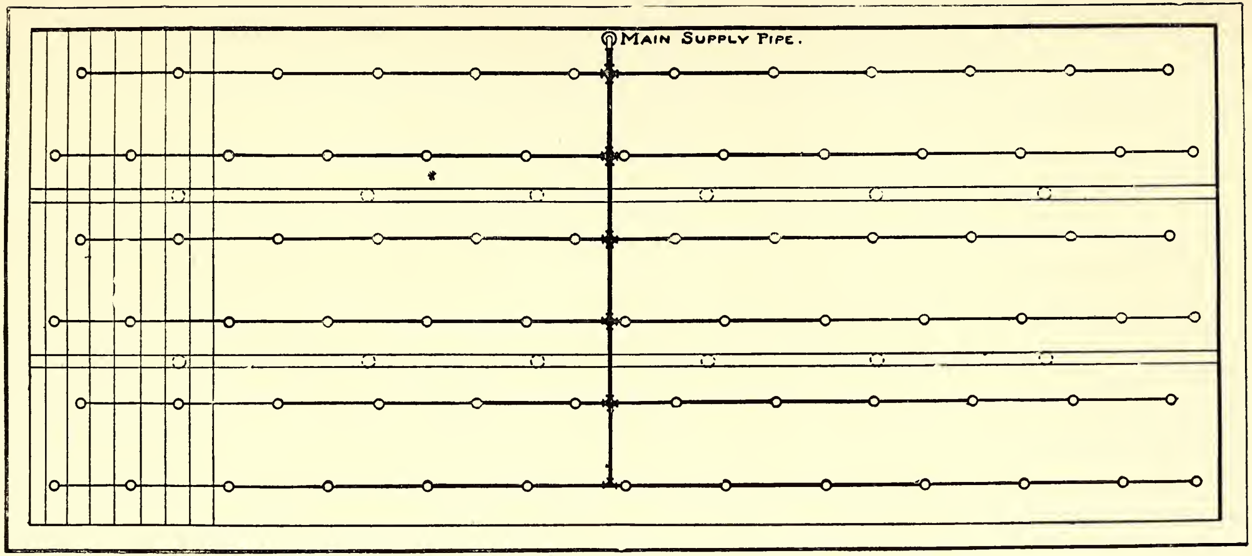
3. Distance of deflectors from ceilings or bottom of joists to be not less than 3 inches or more than 10 inches.

4. Sprinklers to be placed throughout premises, including inside all closets, basements, lofts and elevator wells and under stairs. Special instructions must be obtained relative to placing sprinklers under large shelves, benches, tables, overhead storage racks and platforms, and inside small inclosures, such as drying and heating boxes, caul boxes, tenter and dry room inclosures, chutes and cupboards. Also over all shafting and gears, even in wet basements, and in boiler rooms, especially if a steam fire pump depends on said boilers for its steam supply. Sprinklers not to be omitted in any room merely because it is damp or wet, without special written consent. It is the province of automatic sprinklers to subdue a fire in its early stages. A fire originating in an unsprinkled section is liable to gain sufficient headway to prevent its being checked by the sprinklers in other portions. It is essential, therefore, that equipment be *thorough.*

Note.—Where two or more floors communicate by skylight, stairway,



Sprinkler Arrangement, Bayed Ceiling



SPRINKLER ARRANGEMENT, STAGGERED SPACING, SIDE CENTRAL FEED.

elevator or other openings, they will be considered as one in these requirements, unless all the openings are trapped to the satisfaction of this association, or are surrounded by substantial curtain boards or cornices (to bank up the heated air at least six inches below the fusible device of the sprinkler heads) to the approval of this association.

5. *Not more than six sprinklers* to be placed *on one branch line* of pipe, except under special regulations as to pipe sizes. (See Article 22.)

6. Each automatic sprinkler to have an unobstructed outlet of such size and form that with 5 pounds' pressure maintained at the sprinkler it will discharge approximately 12 gallons per minute.

FEED MAINS AND RISERS.

7. "Center central" or "side central" feed to sprinklers is recommended. The former preferred, especially where there are over six sprinklers on a branch line. End feed is not approved.

8. There should be a separate riser in each building, and in each section of a building divided by fire walls. The size of each riser to be sufficient to supply all the sprinklers on any one floor, as determined by the standard schedule of pipe sizes. If the conditions warrant, special permission will be granted allowing the sprinklers in a fire section of *small area* to be fed from the riser in another section.

9. Where there are sprinklers enough in one room to require a six-inch riser, according to schedule, it is preferable to have these sprinklers supplied through two or more smaller risers.

10. A belt, stair, or elevator tower, having floor openings without "shut offs," is to be treated as one room, and pipe sizes arranged accordingly. Sprinklers to be on a separate riser with independent shut-off and drip valves.

11. Circulation of water in sprinkler pipes is very objectionable, owing to greatly increased corrosion, deposit of sediment, and condensation drip from pipes; for this reason pipes must not be used in any way for domestic service.

12. Hand hose, *to be used for fire purposes only*, may be attached to sprinkler pipes within a room under the following restrictions: Hose not to be larger than three-quarter inch; nozzle not to be larger than three-eighths inch; hose not to be connected to any sprinkler pipe smaller than 2½ inches, never to be attached to a dry-pipe system.

SPACING OF SPRINKLERS.

13. The distance from wall or partition must never exceed one-half the distance between sprinklers in the same direction.

14. A line of sprinklers should be run on each side of a partition. Cutting holes through a partition to permit sprinklers on one side thereof to distribute water to the other side is not effectual.

15. Under Mill Ceilings.—(Smooth solid plank and timber construction, 6 to 12 feet bays).—One line of sprinklers should be placed in center of each bay, and distance between the sprinklers on each line should not exceed the following:—

7 to 8 feet in 12-foot *bays.
8 to 9 feet in 11-foot *bays.
10 feet in 6 to 10-foot *bays.

16. Under Joist Ceilings, Open Finished.—Distance between sprinklers not to exceed seven to eight feet at right angles with joists or nine to ten feet parallel with joists.

17. Bays formed by timbers which support the joists, if from 10 to 11½ feet wide from center to center of timbers, may, by special permission, have but one line of sprinklers, if the conditions warrant. In all cases where such bays are over 11½ feet wide, two or more lines of sprinklers must be installed, as required by the standard.

---

* Measuring center to center of timbers.

18. Under a Pitch Roof Sloping More Steeply than One Foot in Four.—One line of sprinklers to be located in peak of roof, and sprinklers on either side to be spaced according to above requirements. Distance between sprinklers to be measured on a line *parallel with roof.*

19. Under open finish, joisted construction floors, decks and roofs, the sprinklers shall be "staggered" spaced, insuring that heads on adjacent lines shall not spray into the same joist channel ways. The end and intermediate sprinklers not to violate the rules for joist work spacing.

20. Special instructions must be received relative to location of sprinklers under floors and roofs of unusual construction which would interfere with distribution of water.

SIZE OF PIPES.

21. In no case shall the number of sprinklers on a given size pipe exceed the following:

Size of Pipe.	Maximum Number of Sprinklers allowed.
¾ inch.	1 sprinkler.
1 "	2 "
1¼ "	4 "
1½ "	8 "
2 "	16 "
2½ "	28 "
3 "	48 "
3½ "	78 "
4 "	110 "
5 "	150 "
6 "	200 "

The above schedule is considered ample for general practice.

22. Schedule for "branch lines," where more than six sprinklers are on one "branch line," after passing the sixth sprinkler the pipe schedule shall apply to the next larger size of piping, viz.:

Size of Pipe.	Maximum Number of Sprinklers allowed.
¾ inch.	1 sprinkler.
1 "	2 "
1¼ "	4 "
1½ "	6 "
2 "	8 "
2½ "	16 "
3 "	28 "

Furthermore, no feeder to any such "branch line" shall be smaller than said "branch line."

WATER SUPPLY FOR SPRINKLERS.

23. Double Supply.—Two independent water supplies are absolutely essential for the best equipment. At least one of the supplies should be automatic and one should be capable of furnishing water under heavy pressure. The following are accepted supplies: Public water works system, duplex steam pump, private reservoir or standpipe, elevated gravity tank, air pressure tank, rotary pump. The choice of water supplies to be determined by the underwriters having jurisdiction.

24. In addition to the above required double supply, a hose inlet to sprinkler system fitted with a straightway check valve, may be made for connection from steamer of public fire department.

25. Public Water Works System.—Should give good pressure at all hours of the day at highest line of sprinklers, preferably not less than twenty-five pounds static pressure.

26. Street main should be of ample size, in no case smaller than six inches.

27. If possible, avoid a dead end in street main by arranging main to be fed at both ends.

28. Connection from yard pipe to sprinkler riser should be equal to or larger in size than the riser, and should supply no hydrant or standpipe.

29. No meter to be placed in this connection except by special consent.

30. Steam Pump.—An approved duplex steam pump (underwriters' pattern preferred), never less than 500 gallons rated capacity per minute, so located on the premises as to be free from damage by fire or other causes, and to take water from reservoir or some other source having a sufficient quantity of water to supply the rated capacity of the pump for at least sixty minutes. Suction pipe to have a strainer, and, if the lift be more than five feet, a foot valve may be recommended. The smallest size pump approved is referred to above. Risks of any magnitude require a larger size, particularly if pump is to be a supply for hydrant and hose service as well as sprinkler system.

31. Where a pump does not take water under head, it should be primed from water tank of not less than 200 gallons' capacity, or its its equivalent. Priming pipe to connect into each of the four water chambers.

32. The efficiency of a steam pump is liable to be impaired where it has a lift of over fifteen feet; consequently any greater lift is to be avoided, especially where the suction pipe has a length of over fifty feet.

33. Discharge pipe to contain a spring relief valve and pressure gauge.

34. Two and one-half-inch hose connections with gate valves to be placed in pump discharge, at pump (one connection for every 250 gallons rated capacity of pump). These are required for the purpose of properly testing pump.

35. If an automatic regulator is placed in steam connection to pump, it must be on a pass-by with a shut-off valve on either side of same.

36. Steam pressure of not less than fifty pounds must be maintained at all times. Care should be taken to provide sufficient power to run pump to full rated capacity.

37. Where a steam pump is the primary supply, an automatic gauge to record the steam pressure shall be applied.

38. Pump to be operated at least once a week.

39. Any boiler house on which pump depends for steam supply should be of brick or stone, detached or cut off from main buildings by standard fire doors.

40. Any gate valve to be located in boiler house so that all steam supply to main buildings may be cut off from them in time of fire and reserved for pump.

41. Private Reservoir or Standpipe.—Observe same general regulations as for public waterworks.

42. Gravity Tank.—Elevation of bottom of tank above highest line of sprinklers on system which it supplies to be specified by the Underwriters' Association of the Middle Department, but in no case shall it be less than 15 feet. In plants of moderate size a tank of not less than 5,000 gallons' capacity is required. In extensive plants, or where secondary supply is limited in its capacity, a larger tank, or two or more tanks should be used.

43. Tank should be filled through a pipe of not less than 1¼-inch diameter, and not from a sprinkler system.

44. Tank to be used as a supply to automatic sprinkler system only, except that, at the discretion of the underwriters, tank may be made larger than called for and the *excess supply* used for domestic service.

45. Tell-tale.—All gravity tanks to be provided with a water level

indicating device satisfactory to the Underwriters' Association of the Middle Department.

46. End of sprinkler riser should enter bottom of tank and project above bottom four inches, to avoid sediment entering pipe system.

47. Provision must be made to prevent water in tank, and pipes communicating with the same, from freezing. A tank exposed to the weather should have a double cover provided with trap doors. When a steam pipe is used for heating tank it should be run directly from boilers with controlling valve located in boiler room.

48. A permanent ladder or stairway must be maintained to allow access to tank.

Note.—Ladders to tanks must be substantial and extend at least three feet above tank.

49. Air Pressure Tank.—Total capacity should be 3,500, 4,000 or 4,500 gallons. The 4,500-gallon tanks are generally called for; the diameter and length vary. Some of the more common dimensions follow:—

Capacity.	Diameter.	Length.
3,500 gallons,	60 inches.	24 feet.
	66 inches.	20 feet.
4,000 gallons,	72 inches.	20 feet.
	66 inches.	22 feet.
4,500 gallons.	72 inches.	22 feet.
	66 inches.	25 feet.

50. To be located preferably in upper story of building. The two valves in water gauge are ordinarily to be kept closed, and opened only to ascertain amount of water in tank; this, that breaking of, or leakage about, glass may not cause the escape of pressure.

51. A 1¼-inch pipe is to be connected with water supply for filling tanks. An independent connection not smaller than ¾-inch to be made from air pump to tank. Both water and air connections to be fitted with gate and check valves located at the tank.

52. Tanks are to be filled two-thirds full of water, and then an air pressure pumped up and maintained, such as will give not less than seventy-five pounds initial pressure on highest line of sprinklers.

53. Rotary Pump.—An approved rotary pump, never less than 500 gallons per minute rated capacity, same to have outside gears at both ends. To be located where easy of access, and free as possible from damage by fire. If inside main building, to be arranged, together with water wheel, to start from outside of building; to take water from a source having sufficient quantity of water to supply the rated capacity of the pump for sixty minutes.

54. The efficiency of a rotary pump is liable to be impaired where it has a lift of over ten feet; consequently, any greater lift is to be avoided, especially when the suction pipe has a length of over fifty feet. To have hose connections, relief valve and pressure gauge, same as steam pump. To be started by friction clutch or friction gearing. Care should be taken to provide sufficient power to run pump to full rated capacity.

55. Rust and usage will impair the efficiency of a rotary pump more quickly and to a much greater degree than an Underwriter steam pump. In most cases a rotary pump cannot be as advantageously located, and is under less control. Consequently it is not recommended when practicable to install a steam pump.

VALVES AND FITTINGS.

56. Pipes must be supported in a substantial manner by wrought or cast iron hangers well secured.

57. Long bend fittings are recommended for all the larger pipe sizes.

58. On wet-pipe systems there shall be a test pipe one-half inch in diameter connected directly with riser in upper story and arranged to discharge outside building.

59. There shall be a straightway gate valve and a straightway check valve in the pipe connecting each water supply with sprinkler

system. Straightway check valves to be placed in horizontal pipe, or in vertical pipe "looking up," never "looking down."

60. All gate valves in supply pipes to sprinklers to be of indicator pattern, and to be strapped open with riveted leather straps passing around the riser and spoke of the wheel, or secured open with a seal. Draw off valves to be secured closed. Cases about post gate valves to be arranged to drain.

61. Drip pipes to be arranged so as to drain all parts of system. Drip pipe at main riser to be not smaller than two inches.

62. It is recommended that main discharge pipes from gravity and pressure tanks, as well as from waterworks systems and pumps, connect with sprinkler system at foot of riser. Locate in this lower level the check valve in each connecting pipe; also one gate valve controlling all water supply to sprinklers. Place the gate valve called for in each connecting pipe, close to the supply; as at the tank, pump, or in connecting pipe to riser from waterworks system.

63. Where sprinklers are supplied from yard main, place an outside post indicator gate valve in connecting pipe a safe distance from building, if possible (say forty feet).

64. When a pump, not located in a non-combustible pump house, discharges into a yard main, fed by another supply, a check valve or post gate valve should be placed in this discharge pipe outside the building under ground.

65. Underground check valves should be located in a pit accessible through man-hole.

NOTE.—All underground piping must be of cast iron with leaded joints.

DRY-PIPE SYSTEM.

66. A dry-pipe system is not recommended when a wet-pipe system can be used.

67. The use of an approved dry valve is, however, far preferable to entirely shutting off water supply during cold weather; the latter practice is not sanctioned.

68. Dry system to be maintained throughout the year unless changed by authority of sprinkler equipment committee of this association.

69. Especial care must be taken to arrange all sprinkler pipes and fittings that they may be thoroughly drained. Sprinklers must be located in an upright position.

70. All water supplies to sprinklers must enter system below dry valve.

71. A large number of sprinklers (500 or more) on a dry system should be supplied through two or more dry valves. System to be divided horizontally.

72. No dry valve to be installed unless approved by the Underwriters' Association of the Middle Department.

ALARM VALVES.

73. In the past there have been many patterns of alarm check-valves on the market which have been found thoroughly unreliable. Besides proving a constant annoyance to the assured, they were, in many cases, sources of danger, inasmuch as they afforded the possibility of water being held back from sprinklers, owing to the failure of the valve to open.

The committee believe, however, that a properly constructed valve, such as would meet the requirements to be found in the following report, will prove not only desirable, but almost essential. Such a valve would give instant notice of flow of water in sprinkler pipes, in many cases preventing an excessive water damage. This would be doubly appreciated by the assured, as it would indicate the opening of the sprinkler by injury, as well as from heat of fire.

74. Every automatic sprinkler system should contain an alarm valve so constructed that a flow of water through same would operate an electric gong, a mechanical gong, or both, as the character of the property and circumstances may require. In cities where there is a

thermostat alarm company with a central station, the alarm valve may be connected with such central station. In other places, especially in small towns, the valve may be directly connected with public fire department house or some other suitable place.

75. The use of both electric and mechanical alarms is strongly recommended. The gong of the latter can be located on the outside of building or any other desirable place on the premises.

76. Valve should be so constructed that the flow of water through but one sprinkler would cause it to operate. It must not be affected by the varying water pressures received from street mains or automatic pumps. It must have a water way equal to or greater than the pipe in which it is installed, and must be so designed as to but little diminish the flow of water.

77. Valve to be so located that the passing of water from any of the sources of supply to any of the sprinklers will cause its action. To accomplish this in some equipments it would be necessary to use two or more alarm valves. Construction of valve to be such that it cannot be prevented from opening in full by water column, corrosion, sticking of parts, or sediment. No valve to be installed unless it has the approval of Underwriters' Association of the Middle Department.

78. Water pipe immediately under the dry valve to be tapped with a flushing pipe of equal size arranged to discharge outside of building, same to have a gate valve in it to be sealed shut. This is to wash out the sediment from under side of dry valve, brought there by this dead end.

PLANS AND APPROVAL.

Detailed plans and specifications of equipments (drawn to either a ⅛ or ¼-inch scale) should be filed with this association for reference, and it is recommended that detailed working plans of proposed equipments be submitted to this association for examination, before equipments are installed.

* * * * *

SPECIFICATIONS FOR A PRESSURE TANK AS A WATER SUPPLY TO AUTOMATIC SPRINKLERS.

Heavy water pressure (50 pounds or over) is desirable for the most efficient sprinkler service. Such pressures are obtained:

First.—From public waterworks system.

Second.—Very rarely from private reservoirs or stand-pipes.

Third.—From pressure tanks.

Fourth.—From automatic steam pumps.

At many plants the first is impossible, and the second, if not impossible, extremely expensive. No governor for automatic pumps can be relied upon at all times, thus leaving the pressure tank a desirable high pressure supply for many risks.

ADVANTAGES.

First.—It can be located *within* a building, in most cases on floors already constructed, as it is not unduly heavy, and is conveniently shaped.

Second.—Any pressure desired can be created, thus giving a large discharge from the first sprinklers opened by fire, whether they be located in top floor or basement.

Third.—Located within a building in a room protected by automatic sprinklers on a wet system, no additional heat is required to keep its contents from freezing during cold weather. The danger of freezing is practically removed.

Fourth.—Being air-tight, no evaporation of contents occurs, necessitating frequent filling, and where properly constructed and connected with a well erected sprinkler system needs a minimum of care. As a rule, it will be found that air pressure need not be pumped up oftener than once a month.

Fifth.—The original cost of tank and slight expense for maintenance make this an inexpensive supply.

Sixth.—Simplicity of the device makes it easily understood by any who may have its supervision

DISADVANTAGES.

First.—The quantity of water contained is limited, and may be exhausted without extinguishing the fire. This defect is, in a measure, offset by the requirements of two independent water supplies for every sprinkler system. Preferably, the second supply should be automatic, thus succeeding the pressure tank when its contents become sufficiently reduced; time is also given for the starting of pumps.

Second.—The pressure is reduced as water is discharged, but with proper initial pressure it will not be so lowered as to be inefficient, and at the last will exceed the pressure obtained from many elevated gravity tanks.

Third.—Owing to limited capacity of tank, its chief feature (high initial pressure) cannot be obtained for a dry-pipe system having a large number of sprinklers, as considerable water would have to be discharged to fill piping before distribution could be obtained at all the sprinklers. However, the large dry system is no longer approved, it being the practice to divide the equipment into several sections, each on an independent dry valve.

Fourth.—The tank should not be located below the upper story of a building, and should be of easy access on all sides; this may mean the surrender of room which would ordinarily be used for manufacturing or storage, but it rarely happens that such space cannot be found.

SPECIFICATIONS.

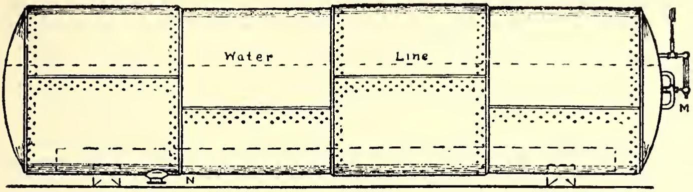
Total capacity to be 3,500, 4,000 or 4,500 gallons. The 4,500-gallon tanks are generally called for. Where a larger supply of water is desired two or more tanks can be used. The diameter and length vary. Some of the more common dimensions follow:

Capacity.	Approximate Weight of Tank and Fittings.	Approximate Weight of Contents. (2/3 water.)	Diameter.	Length.
3,500 gals.	9,400 lbs.	19,400 lbs.	60 in. 66 in.	24 ft. 20 ft.
4,000 gals.	10,000 lbs.	22,200 lbs.	72 in. 66 in.	20 ft. 22 ft.
4,500 gals.	11,000 lbs.	25,000 lbs.	72 in. 66 in.	22 ft. 25 ft.

MATERIAL AND CONSTRUCTION.

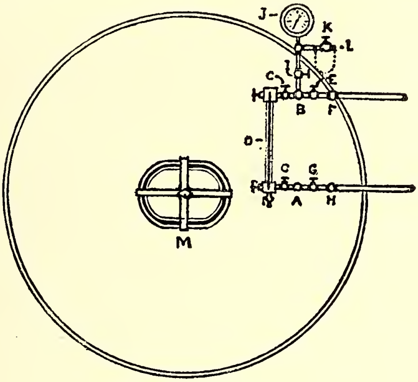
To be of flange steel of even quality, and to have a tensile strength of not less than 60,000 pounds. The shell (or cylindrical part) to be 7-16 inch thick, and heads to be ½ inch thick, convex in form, and dished on a radius equal to their diameters. All outlets in shell, except for water gauge, to have re-enforcing plates riveted to shell. Tank when completed to be tested to 225 pounds cold water pressure, and guaranteed tight under 150 pounds working pressure (air). All edges of plate to be beveled with a planing machine. All longitudinal seams to be treble riveted and located below water line, and all girt seams to be double riveted. Double riveting of girt seams is called for to assist in making seams *air* tight, as well as for strength. All seams to be caulked inside and out. Tank to be completely covered inside and out with one coat of mineral paint.

PRESSURE TANK FOR SPRINKLER SYSTEM.



For End View and Detail of Piping See Below.

PRESSURE TANK FOR SPRINKLER SYSTEM.



NOTATION.

A 1¼ in. connection from tank.
B ¾ in. connection from tank.
C ¾ in. shut-off valves of best quality, to be kept closed.
D ¾ in. water gauge of best quality.
E ¾ in. shut-off valve of best quality.
F ¾ in. check valve of best quality.
G 1¼ in. shut-off valve of best quality.
H 1¼ in. check valve of best quality.
I ¾ in. shut-off valve of best quality, to be secured open.
J 4½ in. dial pressure gauge of best quality reading to 150 lbs.
K ½ in. shut-off valve of best quality, to be secured closed.
L ½ in. brass plug secured by chain; opening is for testing gauge.
M Man-hole.
N 4-in. discharge outlet for connection to sprinkler system.

FITTINGS.

A man-hole to be provided, size about 11¼ inches by 15 inches, located below the water line either at the side or at one of the heads.

A 4-inch discharge outlet to be made at lower side of tank so as to entirely drain contents, this to connect with sprinkler system. One head of tank to be drilled and tapped, and provided with fittings as shown and noted on sketch. A 4-inch wrought iron pipe to connect discharge outside outlet with sprinkler system, same to contain a 4-inch straightway gate valve and check valve, the former to be located near tank.

SETTING UP AND MAINTENANCE.

It is generally found that tanks are too bulky to install complete, and they are ordinarily shipped in sections and set up on the premises.

Tank is generally placed in horizontal position, and must be left accessible on all sides. To be located preferably in upper story of building. The two valves in each connection to water gauge are ordinarily to be kept closed, and opened only to ascertain amount of water in tank; this, that breaking of or leakage about glass may not cause the escape of pressure.

The 1¼-inch pipe is to be connected with water supply and the ¾-inch pipe with air pump.

Tank to be kept two-thirds full of water, and an air pressure (not less than 75 pounds) maintained, such as will give not less than 15 pounds pressure on highest line of sprinklers when all water has been discharged from tank.

It will be found (see explanation below), that 75 pounds air pressure must be maintained if tank is *on a level* with highest sprinklers.

When tank is located *below* the highest sprinklers, it will be necessary to maintain an air pressure greater than 75 pounds, on account of head due to height of sprinklers above tank.

The *excess* pressure required *over 75 pounds* will be equal to *three times* the pressure due to *height* of sprinklers above tank.

EXAMPLE.

Assume highest sprinklers to be 50 feet above tank, then air pressure maintained in tank must be 75 pounds plus three times the pressure due to 50 feet head, or, 75 + 3 × 23 = 144.

EXPLANATION.

The tank is two-thirds full of water and air pressure is 144 pounds. Highest line of sprinklers is 50 feet above tank; which equals 23 pounds pressure at tank, due to head.

The pressure of air in tank will be inversely as the volume, i. e., if volume of air is increased three times, pressure will be decreased in same proportion.

The *actual* pressure in tank is 144 pounds gauge pressure + 15 pounds (approximately) atmospheric pressure = 159 pounds. In order to expel all water from the tank the volume of air will increase threefold and pressure decrease to one-third of 159 pounds (actual pressure) or 53 pounds (actual pressure). Deduct 15 pounds (atmospheric pressure) and there remain 38 pounds gauge pressure at the tank.

This is sufficient to overcome the 23 pounds' pressure due to head and leave 15 pounds final pressure (the amount required) at highest sprinklers.

SUGGESTIONS AND NOTES.

Supports.—It is suggested that the immediate supports of tank be cross pieces of hard pine timber, 10 inches by 10 inches, one for each section of tank, shaped to fit same, and locked into two pieces running lengthwise of tank, thus forming a cradle.

Low Pressure Alarm.—The pressure gauge can be so constructed that the pointer in dropping (say to 70 pounds) will close an electric circuit and sound an alarm gong. We recommend this arrangement.

As stated, tank is built to stand a working pressure of 150 pounds, and thickness of material specified accordingly. This allows the location of tank a considerable distance below the upper line of sprinklers. Many boilermakers will prefer to use less thick stock when lighter pressures are to be maintained.

TABLE OF HEIGHT OF WATER IN HORIZONTAL CYLINDRICAL PRESSURE TANK.

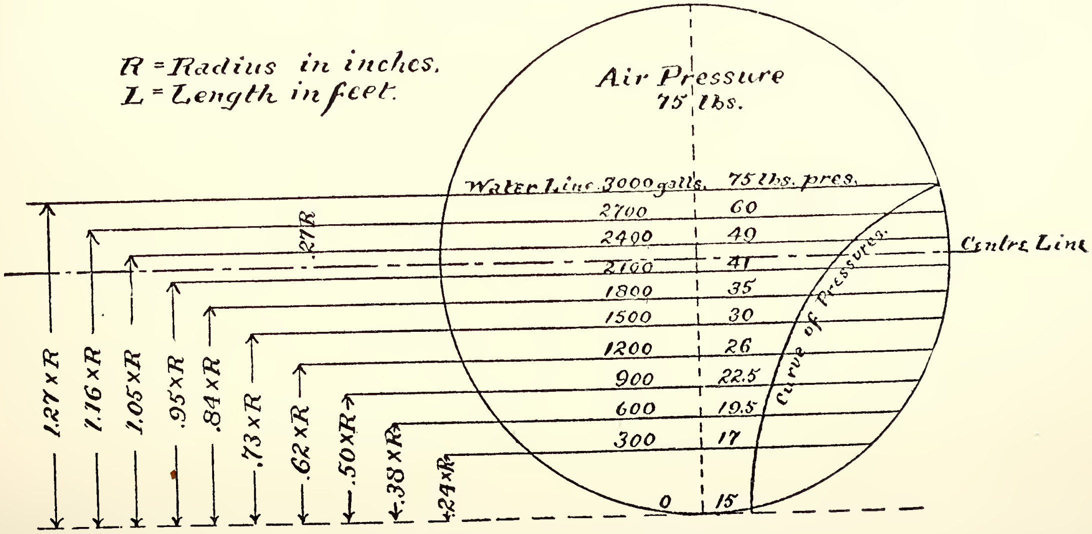
Tank two-thirds full.

Diameter Tank in Inches.	Height in Inches.
56	35¼
57	36
58	36½
59	37¼
60	38
61	38½
62	39¼
63	39¾
64	40½
65	41
66	41¾
67	42¼
68	43
69	43¾
70	44¼
71	45
72	45½
73	46
74	46¾
75	47½
76	48

Pressure tanks can be made at any boiler works.

Quantity, Pressure and Height of Water in Pressure Tanks.

R = Radius in inches.
L = Length in feet.



Total Capacity of Tank =
R^2 (inches) × L (feet) × .1632 galls.

AUTOMATIC CHEMICAL FIRE EXTINGUISHING SYSTEMS.

The chief point of difference between automatic chemical fire extinguishers and automatic sprinklers is that the former distribute carbonic acid gas, whereas the latter distribute water. There are, of course, minor variations in the mechanical installation due to this vital distinction. As this method of fire extinguishment was devised but a few years ago, and has not yet come into very general use, its opportunities for practical tests in accidental fires have not been sufficiently numerous to admit of any fair comparison being made between it and the water sprinkler plan. One of the greatest advantages of a chemical extinguishing system would naturally be the elimination of water damage, when fires were put out without extraneous aid. Such a system should be especially valuable on shipboard, as materials for the filling of all air space in a loaded ship of large proportions would probably weigh less than a ton, and the necessity of pumping possibly hundreds of tons of water into the ship, damaging cargo and reducing the ship's buoyancy would be obviated.

The general plan includes pipes running from the generating tank to the localities to be protected. The pipes are supplied at intervals with fusible valves, and the mechanism and materials are so arranged that the melting of one of the solder joints, opening a valve, simultaneously starts the generation of carbonic acid gas in the tank and its distribution through the pipes and such valves as are open.

The manufacturers of extinguishing systems of this character are listed below:

Livingston Automatic Fire Extinguisher Company, New Orleans, La.

Fire Extinguisher Manufacturing Company., 313 South Desplaines street, Chicago, Ill.; S. F. Hayward & Co., Eastern Agents, 357 Canal street, New York.

NON-AUTOMATIC CHEMICAL FIRE EXTINGUISHERS.

For many years past portable chemical fire extinguishers have been known and used with excellent results. Most of those now in the market are of the liquid type. By a simple process, in some of them by merely inverting the extinguisher, is started the generation of carbonic acid gas, which, by its own pressure, forces a stream of water and gas where directed upon the fire. As combustion cannot go on in an atmosphere heavily charged with carbonic acid gas, the fire is quickly extinguished where-ever reached by the gas. Other chemical extinguishers are in the form of powder and are claimed to act with great celerity and effect. The powder being thrown, if possible, at the base of the fire, is carried up by the fire and acts upon the latter during its progress upward.

An improvement upon the ordinary form of chemical fire extinguisher is the Stationary Chemical System, which is especially valuable in office buildings, dwellings and some classes of warehouses. This system provides powerful streams of many times the extinguishing power of water upon simply pressing an electric button. The accompanying illustration will show the general plan of this system.

The National Fire Protection Association has prepared a series of specifications concerning the general construction of chemical fire extinguishers, which, while not as yet compulsory throughout the country, have been adopted by some organizations of underwriters, and are likely to be by others. It is therefore advisable to ascertain whether the extinguishers now owned or which may be hereafter offered for sale comply with the requirements.

NON-AUTOMATIC CHEMICAL FIRE EXTINGUISHERS.

Little Giant Fire Extinguisher,

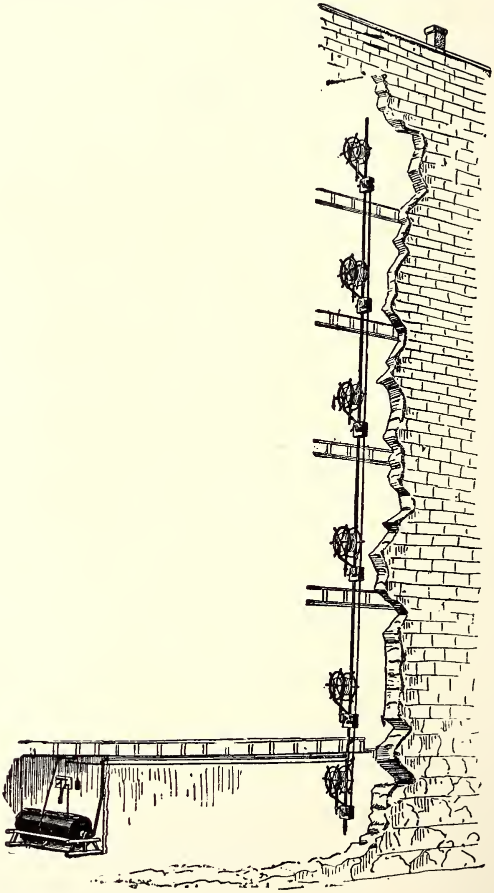
Made by Little Giant Fire Extinguisher Co., 19 Liberty Street, New York.

LITTLE GIANT FIRE EXTINGUISHER.

This is a valuable device, simple in construction, economical of space, efficient in operation, low in price. It can be handled to advantage by a child, as it weighs but 3 pounds. Is always ready for service; the liquid does not evaporate and will not freeze at a temperature of several degrees below zero. By its syringe plan of operation a stream can be thrown 25 feet. The solution, in contact with heat, generates an immense volume of fire-destroying gas, which rises quicker than the fire. Especially useful in flue fires and those in partitions and in and near ceilings.

Rex Fire Extinguisher.
Victor Fire Extinguisher.
Rex Chemical Engine and Combination Wagon.

Rex Fire Department, Railroad and Steamboat Extinguisher.
Rex Chemical Engine.
Made by Rex Fire Extinguisher Company, 145 Center street, New York.
Diggs.—Made by D. W. Diggs, 143 Center street, New York.
Standard Babcock.
Pony Babcock.
Domestic Babcock.
Babcock, Jr.
Champion.
Champion Liquid Seal.
Champion Stationary Chemical Fire Engine.
Champion Chemical Fire Engine.



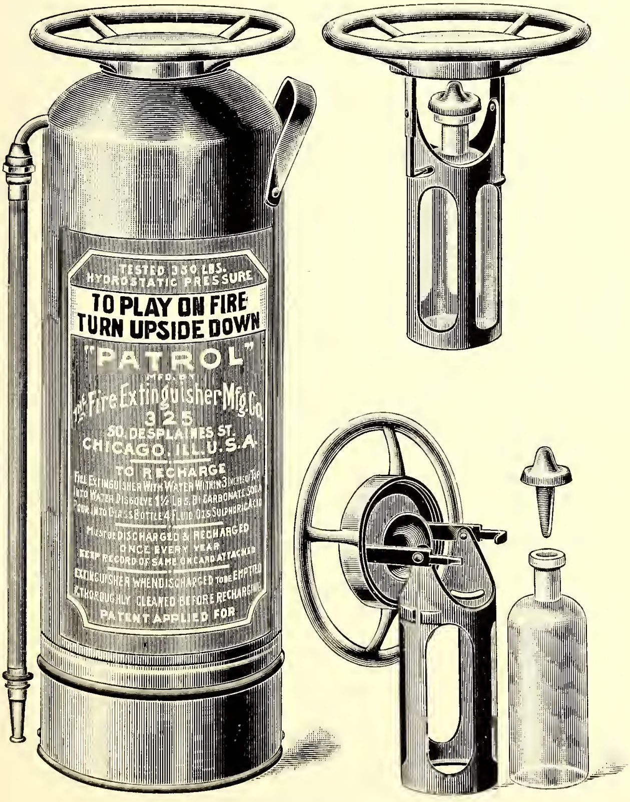
STATIONARY CHEMICAL FIRE EXTINGUISHING SYSTEM OPERATED BY CARBONIC ACID GAS AND PROTECTING ALL PORTIONS OF AN EQUIPPED BUILDING.

Patrol Combination Chemical Engine and Hose Wagon.
Made by Fire Extinguisher Manufacturing Company, 313 S. Desplaines street, Chicago, Ill.; S. F. Hayward & Co., Eastern Agents, 357 Canal street, New York.

Hayward Hand Grenade Fire Extinguishers.—Made by S. F. Hayward & Co., 357 Canal street, New York.

The Stempel Fire Extinguisher has often proved of incalculable assistance in fire defense. It has been universally indorsed by fire underwriters throughout the country, and is used in quantities by numerous manufacturing concerns. Its mechanism is simple and can always be relied upon to operate in an emergency. The chemical charge is hermetically sealed and retains its strength indefinitely. The charge is broken when the extinguisher is inverted for use, by the falling of a ball. It can readily be recharged, throws a chemical stream further than any other extinguisher, and is absolutely more effective than any similar device. The Stempel has met in contest every extinguisher in the United States of any worth, and has in every instance easily secured first honors. It has been adopted for use by the United States Government and many fire departments, after practical tests by officials. Prices and descriptions will be cheerfully furnished upon application.

Stempel.—Made by Stempel Fire Extinguisher Manufacturing Company, 1903 Locust street, St. Louis, Mo.


TESTED 350 LBS.
HYDROSTATIC PRESSURE
TO PLAY ON FIRE
TURN UPSIDE DOWN
"PATROL"
MFD. BY
The Fire Extinguisher Mfg. Co.
325
SO. DESPLAINES ST.
CHICAGO, ILL. U.S.A.
TO RECHARGE
FILL EXTINGUISHER WITH WATER WITHIN 3 INCHES OF TOP
INTO WATER DISSOLVE 1½ LBS BI CARBONATE SODA
POUR INTO GLASS BOTTLE 4 FLUID OZS SULPHURIC ACID
MUST BE DISCHARGED & RECHARGED
ONCE EVERY YEAR
KEEP RECORD OF SAME ON CARD ATTACHED
EXTINGUISHER WHEN DISCHARGED TO BE EMPTIED
& THOROUGHLY CLEANED BEFORE RECHARGING
PATENT APPLIED FOR

PATROL CHEMICAL FIRE EXTINGUISHER.

Kilfyre.—Made by Monarch Fire Appliance Company, 27 William street, New York.

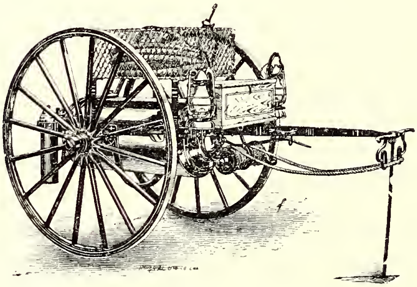
KILFYRE.

This is a dry, dustlike compound put up in handsomely decorated metal tubes, twenty-two inches long by two inches in diameter, which, upon coming in contact with heat or flame, will concentrate upon the fire many more times the quantity of fire-destroying gases than can be applied in any other way. All that is required to instantly put out a fire is to remove the cap and throw the contents of the tube at the base of the fire. Kilfyre has been subjected in the past to fires of almost every description, and has not yet a single failure charged against it, while thousands of testimonials proclaim its efficacy. Anyone desiring to further investigate this wonderful fire fighter can obtain information by applying to the Monarch Fire Appliance Company, 27 William street, New York.

Handly Nonpareil Automatic Fire Extinguisher.—Made by Fire Extinguisher & Supply Company, 208 Federal street, Allegheny, Pa.

Eureka Fire Extinguisher.—Made by H. H. Charles Co., Quincy, Ill.

Harden No. 1 Fire Extinguisher.



Champion Chemical Fire Engine for Factory Use.

Hayward Hand Grenade.

Harden Hand Grenades.

Made by Harden Hand Grenade Company, 53 Dearborn street, Chicago, Ill.

Improved Co-operative Fire Extinguisher.

Excelsior Fire Extinguisher.

Excelsior Chemical Engine.

Made by F. Meyrose Lamp & Manufacturing Co., St. Louis, Mo.

Common Sense Fire Extinguisher.—Made by Common Sense Fire Extinguisher Company, Allegheny, Pa.

I-X-L Fire Extinguisher.—Made by S. Joseph & Co., 42 W. State street, Columbus, Ohio.

Defender Fire Extinguisher.—Made by Defender Fire Extinguisher Company, 277 Broadway, New York.

Capitol.—Made by Capitol Fire Extinguisher Company, 133 Arcade building, Cleveland, Ohio.

The introduction of the Underwriters' Fire Extinguishers, less than five and one-half years ago, with their excellent principle of "slow feed," marked a great advance in portable extinguishers. During that time they have made a record for reliability and efficiency never equaled.

They are officially indorsed by twenty-seven Boards of Underwriters. They have put out more than 1000 actual fires, and have saved a large amount of property.

They have had a large sale, and as their merit becomes better known, the annual output increases.

The new No. 6 complies with all the requirements of the National Fire Protection Association.

Underwriters.—Made by Knight & Thomas, 31 Central street, Boston, Mass.

Miller.—Made by Miller Chemical Engine Company, 3 S. Water street, Cleveland, Ohio.
Utica.—Made by O. J. Childs Company, Utica, N. Y.
Vishnu.—Made by F. C. Wilson & Co., 239 Lake street, Chicago, Ill.

OTHER MANUFACTURERS OF NON-AUTOMATIC FIRE EXTINGUISHERS.

National Fire Extinguisher Company, New England Building, Kansas City, Mo.
D. A. Woodhouse, 9 Barclay street, New York.
Handly Chemical Nozzle.—Made by Fire Extinguisher & Supply Company, 208 Federal street, Allegheny, Pa.

CHEMICAL FIRE PAILS.

Underwriters have for a long time required the maintenance of casks of water, with handy pails, or pails filled with water for use in case of fire only; and these safeguards have been the means of saving many thousands of dollars. An improvement upon the ordinary fire pail, however, is found in the chemical fire pails which are now manufactured. As a general class, these pails are designed not only to have the full effect of a pail of water, but, by combination with chemicals, which only mix with the water when actually used in case of fire, to multiply the effect and produce the good results of a chemical extinguisher. There are several varieties of them which are named below.

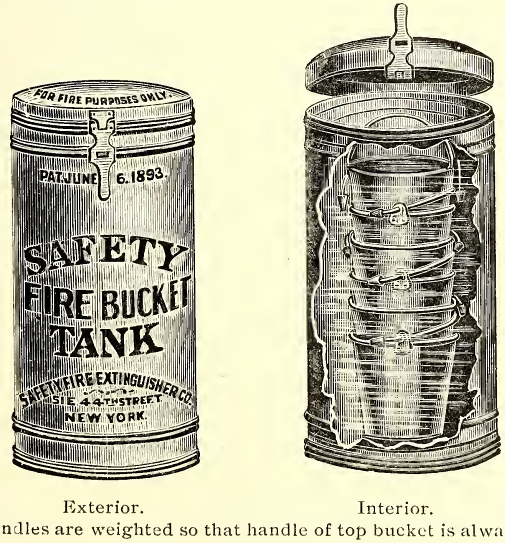
CHEMICAL FIRE PAILS.

American Chemical Fire Pail.—Made by American Chemical Fire Pail Company, 136 Chestnut street, Philadelphia, Pa.

Worcester Chemical Compartment Fire Pail (Lincoln's Patent).—Made by Worcester Chemical Fire Pail Co., Worcester, Mass.

Myer's Air-Tight Chemical Fire Pail.—Made by Frank B. Chase, 400 Franklin avenue, Brooklyn, N. Y.

BUCKET TANKS.


FOR FIRE PURPOSES ONLY.
PAT. JUNE 6. 1893.
SAFETY
FIRE BUCKET
TANK
SAFETY FIRE EXTINGUISHER CO.
51 E 44TH STREET
NEW YORK.

Exterior. Interior.

Bucket handles are weighted so that handle of top bucket is always erect.

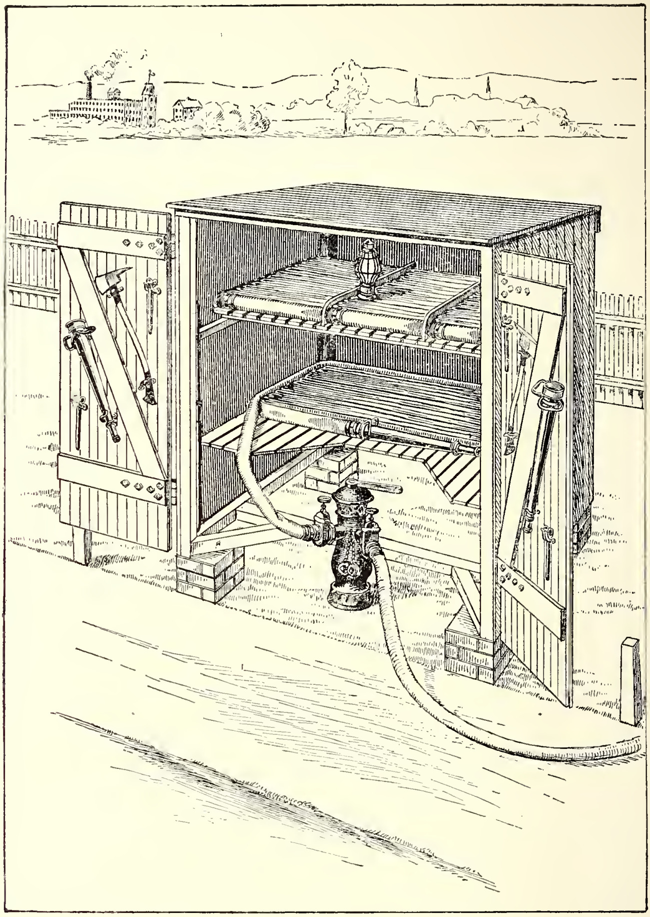
Safety Fire Bucket Tank.

Safety Fire Bucket Tank and Buckets.—Made by Safety Fire Extinguisher Company, 29 W. Forty-second street, New York.

OTHER NON-AUTOMATIC FIRE FIGHTING APPLIANCES.

It is especially desirable for a large manufacturing establishment, particularly if it be located at some distance from a city fire department, to have its own private fire department. This can be established and maintained among the employees with comparative ease, and can be made very efficient if those in authority take a sufficient interest in the matter to require a thorough drilling of the men. The chief and other officers should be chosen from the executive staff, and the distribution of offices should be so arranged that either the chief or an assistant should be constantly on the ground to take command in case of an alarm. Drills should take place at frequent intervals, and each man should be given some particular duty, so that in event of a fire there should be no confusion, but every man would go directly to his post and all would work together harmoniously. The men should be practiced in their particular duties, some being told off to connect and disconnect hose and turn on and off the water; others to run out and lay hose lines, manage play pipes, etc.; still others should be placed in charge of the ladders. It has been found advisable in many instances to build permanent ladders in order to facilitate quick work in case of fire. The members of the department should have practice in playing streams in order to become accustomed to handling them. Hose should be laid without twists or kinks and sharp turns should be avoided, otherwise the hose is likely to burst or to pull away from the men. The department should be fully equipped with the paraphernalia necessary to effective work and everything should be cared for in a thorough and systematic manner. A hose house should be built over each hydrant, and hose should be attached to the hydrant and laid properly upon the shelves above it, ready for instant use. All necessary tools, etc., should be attached to the doors of the hose house. Below will be found the Factory Insurance Association's excellent plan for building and arranging a hose house.

Some of the many devices designed to aid in the extinction of fire are listed below, together with the names of the makers. The subject of fire hose was investigated to a limited extent by a committee appointed by the National Fire Protection Association. The committee considered one branch of the subject, namely, the type known as "Woven Cotton Rubber-Lined," and formulated requirements as to the materials to be used in such hose and the tests which it must withstand in order to be entitled to be styled and sold as "National Standard." All hose used should be of approved quality.

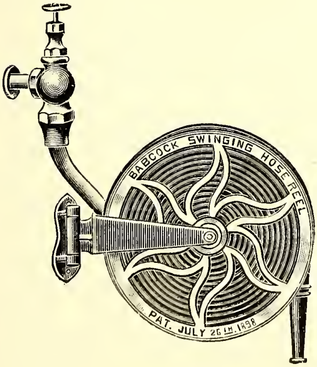


Standard Hose House for Two-Way Hydrant.

Below will be found the names and addresses of prominent dealers in fire protective supplies:

Fire Ladders, Hose Reels and Trucks.—Made by Gleason & Bailey Manufacturing Company, 20 W. Houston street, New York.
Miscellaneous Protective Appliances.—Made by D. A. Woodhouse, 59 Park Place, New York.
Hose, etc.—Made by Boston Woven Hose & Rubber Company, 275 Devonshire street, Boston, Mass.
Test Carbolized Fire Hose.
Dragon Jacket Cotton Fire Hose.
Cable Jacket Cotton Fire Hose.
Lenox Jacket Cotton Fire Hose.
Czar Cotton Fire Hose.

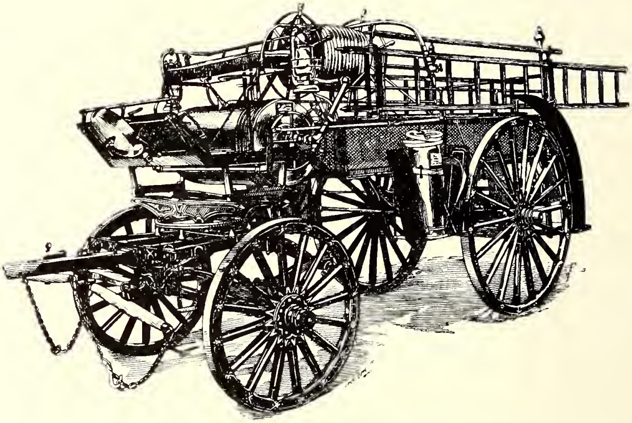
Ætna Single Jacket Hose.
Afmic Cotton Rubber-Lined Factory Fire Hose (Standard).
Carbon Cotton Mill Hose.
Leatherite Cotton Fire and Mill Hose.
Standard Linen Hose.
Smooth-Bore Suction Hose.
Test Brand and Other Play Pipes.
Fire Buckets and Pails.
Couplings, Nozzles, Hydrant Gates and Other Supplies.
Chemicalized Nozzle.
Hose Racks, Reels and Carts.
Made by New York Belting & Packing Company, 25 Park place, New York.
Gasoline Fire Engines.
Steam Fire Engines.
Fire Hydrants.
Hose Carts, Hook and Ladder Trucks, and other supplies.
Made by Waterous Engine Works Company, St. Paul, Minn.
Nuhring's Swinging Hose Rack.
Nuhring's Automatic Hose Rack.
Nuhring's "I X L" Linen Fire Hose.
Safety Automatic Fire Hose Reel.
Made by Chas. Nuhring, 907 Walnut street, Cincinnati, Ohio.
Anchor Brand, Mineralized Rubber Hose.
Anchor Brand Rubber Fire Hose.
Salamander Cotton Jacket Fire Hose.
Single Cotton Hose.
Linen Hose.
Anchor Brand Rubber Suction Hose.
Portable Hose Reel.
Hose Rack.
Callahan's Shut-Off Nozzle.
Brass Nozzles, etc.
Made by Mineralized Rubber Company, 18 Cliff street, New York.
Hook and Ladder Trucks.
Chemical Extinguisher Carts.
Hose Carriages.
Hand Fire Engines.
Fire Ladders.
Made by Rumsey & Co., Ltd., Seneca Falls, New York.
Hand Fire Engines.—Made by Gould's Manufacturing Company, Seneca Falls, N. Y.



BABCOCK SWINGING HOSE REEL.

FIRE PAIL.

Galvanized Iron Fire Pails (square or round bottomed).—Made by Chas. A. Allen, 35 Dey street, New York.
Galvanized Iron Fire Pails.
Leather Fire Buckets.
Hayward Swinging Hose Reel.
Swinging Hose Racks.
Cotton-Lined Fire Hose.
Mill Hose.
Chemical Engine Hose.
Linen Hose.
Rubber Hose.
Steel-Clad Suction Hose.
Couplings.
Nozzles and General Supplies.
Made by S. F. Hayward & Co., 357 Canal street, New York.
New Ahrens' Fire Engines.
Metropolitan Fire Engines.
Woven Gum-Treated Cotton and Rubber Fire Hose, and Fire Department Supplies.—Made by Fabric Fire Hose Company, 68 Murray street, New York.
Handly Chemical Nozzle.—Made by Fire Extinguisher & Supply Company, 208 Federal street, Allegheny, Pa.



CHAMPION BABCOCK COMBINATION CHEMICAL ENGINE AND HOSE WAGON.

Columbian Fire Engines.
Silsby Fire Engines.
Clapp & Jones' Fire Engines.
Button Fire Engines.
Hand Engines and Hose Carts.
Hose, Connections and Nozzles.
Made by American Fire Engine Company, Seneca Falls, N. Y.

FIRE ESCAPES.

In view of the constant danger by reason of fires in factories, mercantile buildings, hotels and private dwellings, many ingenious contrivances have been invented for the preservation of life. Public fire departments, especially in the larger cities, are well equipped with extension and pompier ladders, life nets, etc., and in some cities it is required by law that buildings of certain classes or above certain height limits shall be equipped with fire escapes. Devices of this character have been designed to meet the requirements of different kinds of buildings, some being permanent and stationary fixtures for the exterior of the edifice, others being affixed to the interior in such manner that they can be readily utilized in case of danger. Some manufacturers of these appliances are mentioned below:

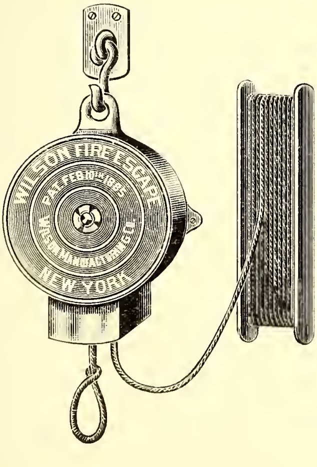
Kirker-Bender Spiral Fire Escapes.—Made by Dow Wire Works Company, Louisville, Ky.

Harris Fire Escapes.—Made by Harris Safety Company, Twenty-sixth street and Broadway, New York.

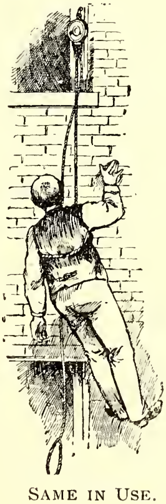
Rice Pulley Fire Escape.

Rice Ball and Rope Fire Escape.

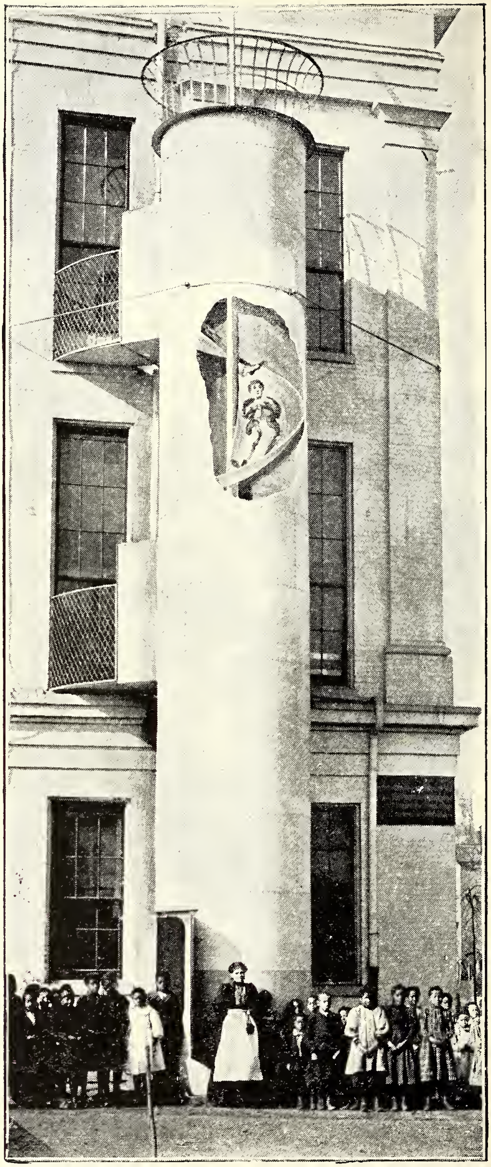
Made by Gleason & Bailey Manufacturing Company, 20 W. Houston street, New York.



WILSON FIRE ESCAPE.



SAME IN USE.

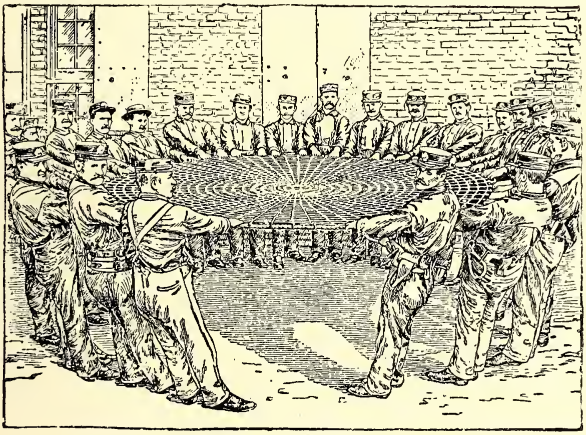


Kirker-Bender Spiral Fire Escape.

Wilson Portable Fire Escape.
Empire Life-Saving Net.
Made by S. F. Hayward & Co., 357 Canal street, New York.

OTHER MANUFACTURERS OF FIRE ESCAPES.

Monarch Manufacturing Company, Indianapolis, Ind.
Central Iron Works, 420-422 East Forty-eighth street, New York.
G. W. Mittnach, 23 Spring street, New York.
S. Nichol's Son, 66 W. Third street, New York.
M. Nussberger, 147 Baxter street, New York.
Poppke & Son, 805 Lexington avenue, New York.



LIFE SAVING NET.

A. Smith, 447 Pleasant avenue, New York.
Wm. R. Pitt Composite Iron Works, 111 Fifth avenue, New York.

ELECTRICAL RULES.

The beginning of electrical rule making was some time prior to October 19, 1881, on which date the New York Board of Fire Underwriters issued a printed circular warning property-owners that certain violations of the board's rules must be remedied. From that time the progress toward a uniform code of rules for the entire country was slow, but steady, culminating in the promulgation in 1897 by the National Board of Fire Underwriters of the "National Electrical Code," which is the result of the united efforts of the associations named below through the National Conference on Standard Electrical Rules, American Institute of Architects, American Institute of Electrical Engineers, American Society of Mechanical Engineers, American Street Railway Association, Factory Mutual Fire Insurance Companies, National Association of Fire Engineers, National Board of Fire Underwriters, National Electric Light Association, Underwriters' National Electric Association.

In the production of these rules the underwriters availed of the expert knowledge of the electricians, and the rights and wishes of the latter were recognized in every way not opposed to the reduction of the fire hazard.

NATIONAL ELECTRICAL CODE.

GENERAL PLAN GOVERNING THE ARRANGEMENT OF RULES.

- Class A.—Central Stations, Dynamo, Motor and Storage-Battery Rooms, Transformer Substations, etc. Rules 1 to 11.
- Class B.—Outside Work, all systems and voltages. Rules 12 and 13.
- Class C.—Inside Work. Rules 14 to 39. Subdivided as follows:
  - General Rules, applying to all systems and voltages. Rules 14 to 17.
  - Constant-Current systems. Rules 18 to 20.
  - Constant-Potential systems.
    - All voltages. Rules 21 to 23.
    - Voltage not over 300. Rules 24 to 31.
    - Voltage between 300 and 3,500. Rules 32 to 37.
    - Voltage over 3,500. Rules 38 to 39.
- Class D.—Specifications for Wires and Fittings. Rules 40 to 63.
- Class E.—Miscellaneous. Rules 64 to 67.
- Class F.—Marine Wiring. Rules 68 to 80.

GENERAL SUGGESTIONS.

In all electric work conductors, however well insulated, should always be treated as bare, to the end that under no conditions, existing or likely to exist, can a grounding or short circuit occur, and so that all leakage from conductor to conductor, or between conductor and ground, may be reduced to the minimum.

In all wiring, special attention must be paid to the mechanical execution of the work. Careful and neat running, connecting, soldering, taping of conductors and securing and attaching of fittings, are specially conducive to security and efficiency, and will be strongly insisted on.

In laying out an installation, except for constant-current systems, the work should, if possible be started from a center of distribution, and the switches and cutouts, controlling and connected with the several branches, be grouped together in a safe and easily accessible place, where they can be readily got at for attention or repairs. The load should be divided as evenly as possible among the branches, and all complicated and unnecessary wiring avoided.

The use of wire-ways for rendering concealed wiring permanently accessible is most heartily indorsed and recommended; and this method of accessible concealed construction is advised for general use.

Architects are urged, when drawing plans and specifications, to make provision for the channeling and pocketing of buildings for electric light or power wires, and in specifications for electric gas lighting to require a two-wire circuit, whether the building is to be wired for electric lighting or not, so that no part of the gas fixtures or gas piping be allowed to be used for the gas-lighting circuit.

CLASS A.—STATIONS AND DYNAMO ROOMS.

Includes Central Stations, Dynamo, Motor and Storage-Battery Rooms, Transformer Substations, Etc.

1. Generators—

a. Must be located in a dry place.

b. Must never be placed in a room where any hazardous process is carried on, nor in places where they would be exposed to inflammable gases or flyings of combustible materials.

c. Must be insulated on floors or base frames, which must be kept filled to prevent absorption of moisture, and also kept clean and dry. Where frame insulation is impracticable, the inspection department having jurisdiction may, in writing, permit its omission, in which case the frame must be permanently and effectively grounded.

A high-potential machine which, on account of great weight or for other reasons, can not have its frame insulated from the ground, should be surrounded with an insulated platform. This may be made of wood, mounted on insulating supports, and so arranged that a man must always stand upon it in order to touch any part of the machine.

In case of a machine having an insulated frame, if there is trouble from static electricity due to belt friction, it should be overcome by placing near the belt a metallic comb connected with the earth, or by grounding the frame through a very high resistance of not less than 200 ohms per volt generated by the machine.

d. Every constant-potential generator must be protected from excessive current by a safety fuse, or equivalent device, of approved design in each lead wire.

These devices should be placed on the machine or as near it as possible. Where the needs of the service make these devices impracticable, the Inspection Department having jurisdiction may, in writing, modify the requirements.

e. Must each be provided with a waterproof cover.

f. Must each be provided with a name-plate, giving the maker's name, the capacity in volts and amperes, and the normal speed in revolutions per minute.

2. Conductors—

From generators to switchboards, rheostats or other instruments, and thence to outside lines.

a. Must be in plain sight or readily accessible.

b. Must have an *approved* insulating covering as called for by rules in Class "C" for similar work, except that in central stations, on exposed circuits, the wire which is used must have a heavy braided non-combustible outer covering.

Bus bars may be made of bare metal.

c. Must be kept so rigidly in place that they can not come in contact.

d. Must in all other respects be installed under the same precautions as required by rules in Class "C" for wires carrying a current of the same volume and potential.

3. Switchboards—

a. Must be so placed as to reduce to a minimum the danger of communicating fire to adjacent combustible material.

Special attention is called to the fact that switchboards should not be built down to the floor, nor up to the ceiling, but a space of at least ten or twelve inches should be left between the floor and the board, and from eighteen to twenty-four inches between the ceiling and the board in order to prevent fire from communicating from the switchboard to the floor or ceiling, and also to prevent the forming of a partially concealed space very liable to be used for storage of rubbish and oily waste.

b. Must be made of non-combustible material or of hardwood in skeleton form, filled to prevent absorption of moisture.

c. Must be accessible from all sides when the connections are on the back, but may be placed against a brick or stone wall when the wiring is entirely on the face.

d. Must be kept free from moisture.

e. Bus bars must be equipped in accordance with rules for placing conductors.

4. Resistance Boxes and Equalizers—

(For construction rules, see No. 60.)

a. Must be placed on a switchboard or, if not thereon, at a distance of a foot from combustible material, or separated therefrom by a non-inflammable, non-absorptive, insulating material.

5. Lightning Arresters—

(For construction rules, see No. 63.)

a. Must be attached to each side of every overhead circuit connected with the station.

It is recommended to all electric light and power companies that arresters be connected at intervals over systems in such numbers and so located as to prevent ordinary discharges entering (over the wires) buildings connected to the lines.

b. Must be located in readily accessible places away from combustible materials, and as near as practicable to the point where the wires enter the building.

Station arresters should generally be placed in plain sight on the switchboard.

In all cases, kinks, coils and sharp bends in the wires between the arresters and the outdoor lines must be avoided as far as possible.

c. Must be connected with a thoroughly good and permanent ground connection by metallic strips or wires having a conductivity not less than that of a No. 6 B. & S. copper wire, which must be run as nearly in a straight line as possible from the arresters to the earth connection.

Ground wires for lightning arresters must not be attached to gas-pipes within the buildings.

It is often desirable to introduce a choke coil in circuit between the arresters and the dynamo. In no case should the ground wire from a lightning arrester be put into iron pipes, as these would tend to impede the discharge.

6. Care and Attendance—

a. A competent man must be kept on duty where generators are operating.

b. Oily waste must be kept in *approved* metal cans and removed daily.

Approved waste cans shall be made of metal, with legs raising can three inches from the floor, and with self-closing covers.

7. Testing of Insulation Resistance—

a. All circuits must be provided with reliable ground detectors. Detectors which indicate continuously and give an instant and permanent indication of a ground are preferable. Ground wires from detectors must not be attached to gas-pipes within the building.

b. Where continuously indicating detectors are not feasible, the circuits should be tested at least once per day, and preferably oftener.

c. Data obtained from all tests must be preserved for examination by the inspection department having jurisdiction.

These rules on testing to be applied at such places as may be designated by the inspection department having jurisdiction.

8. Motors—

a. Must be insulated on floors or base frames, which must be kept filled to prevent absorption of moisture; and must be kept clean and dry. Where frame insulation is impracticable the inspection department having jurisdiction may, in writing, permit its omission, in which case the frame must be permanently and effiectively grounded.

A high-potential machine which, on account of great weight or for other reasons, can not have its frame insulated, should be surrounded with an insulated platform. This may be made of wood, mounted on insulating supports, and so arranged that a man must stand upon it in order to touch any part of the machine.

In case of a machine having an insulated frame, if there is trouble from static electricity due to belt friction, it should be overcome by placing near the belt a metallic comb connected to the earth, or by grounding the frame through a very high resistance of not less than 200 ohms per volt generated by the machine.

b. Must be wired under the same precautions as required by rules in Class "C," for wires carrying a current of the same volume and potential.

The leads or branch circuits should be designed to carry a current at least fifty per cent greater than that required by the rated capacity of the motor to provide for the inevitable overloading of the motor at times without overfusing the wires.

c. The motor and resistance box must be protected by a cutout and controlled by a switch (see No. 17 *a*), said switch plainly indicating whether "on" or "off." Where one-fourth horse-power or less is used on low-tension circuits a single-pole switch will be accepted. The switch and rheostat must be located within sight of the motor, except in such cases where special permission to locate them elsewhere is given, in writing, by the inspection department having jurisdiction.

d. Must have their rheostats or starting boxes located so as to conform to the requirements of No. 4.

In connection with motors the use of circuit-breakers, automatic starting boxes and automatic under-load switches is recommended, and they *must* be used when required.

e. Must not be run in series-multiple or multiple-series, except on constant-potential systems, and then only by special permission of the inspection department having jurisdiction.

f. Must be covered with a waterproof cover when not in use, and, if deemed necessary by the inspection department having jurisdiction, must be inclosed in an approved case.

From the nature of the question the decision as to what is an approved case must be left to the inspection department having jurisdiction to determine in each instance.

g. Must, when combined with ceiling fans, be hung from insulated hooks, or else there must be an insulator interposed between the motor and its support.

h. Must each be provided with a name-plate, giving the maker's name, the capacity in volts and amperes and the normal speed in revolutions per minute.

9. Railway Power Plants—

a. Must be equipped in each feed wire before it leaves the station with an *approved* automatic circuit-breaker (see No. 52) or other device, which will immediately cut off the current in case of an accidental ground. This device must be mounted on a fireproof base, and in full view and reach of the attendant.

10. Storage or Primary Batteries—

a. When current for light and power is taken from primary or secondary batteries, the same general regulations must be observed as applied to similar apparatus fed from dynamo generators developing the same difference of potential.

b. Storage battery rooms must be thoroughly ventilated.

c. Special attention is directed to the rules for rooms where acid fumes exist (see No. 24, *j* and *k*).

d. All secondary batteries must be mounted on non-absorptive, non-combustible insulators, such as glass or thoroughly vitrified and glazed porcelain.

e. The use of any metal liable to corrosion must be avoided in cell connections of secondary batteries.

11. Transformers—

(For construction rules, see No. 62.)

a. In central or substations the transformers must be so placed that smoke from the burning out of the coils or the boiling over of the oil (where oil-filled cases are used) could do no harm.

CLASS B.—OUTSIDE WORK.

All Systems and Voltages.

12. Wires—

a. Service wires must have an *approved* rubber insulating covering (see No. 41). Line wires, other than services, must have an *approved* weatherproof, or rubber insulating covering (see Nos. 41 and 44). All tie wires must have an insulation equal to that of the conductors they confine.

b. Must be so placed that moisture can not form a cross connection between them, not less than a foot apart, and not in contact with any substance other than their insulating supports. Service blocks must be covered over their entire surface with at least two coats of waterproof paint.

c. Must be at least seven feet above the highest point of flat roofs, and at least one foot above the ridge of pitched roofs over which they pass or to which they are attached.

d. Must be protected by a dead insulated guard iron or wires from possibility of contact with other conducting wires or substances to which current may leak. Special precautions of this kind must be taken where sharp angles occur, or where any wires might possibly come in contact with electric light or power wires.

e. Must be provided with petticoat insulators of glass or porcelain. Porcelain knobs or cleats and rubber hooks will not be approved.

f. Must be so spliced or joined as to be both mechanically and electrically secure without solder. The joints must then be soldered, to insure preservation, and covered with an insulation equal to that on the conductors.

All joints must be soldered, even if made with some form of patent splicing device. This ruling applies to joints and splices in all classes of wiring covered by these rules.

g. Must, where they enter buildings, have drip loops outside, and the holes through which the conductors pass must be bushed with non-combustible, non-absorptive insulating tubes slanting upward toward the inside.

h. Telegraph, telephone and similar wires must not be placed on the same cross-arm with electric light or power wires, and when placed on the same pole with such wires the distance between the two inside pins of each cross-arm must not be less than twenty-six inches.

i. The metallic sheaths to cables must be permanently and effectively connected to "earth."

Trolley Wires—

j. Must not be smaller than No. 0 B & S. copper or No. 4 B. & S. silicon bronze, and must readily stand the strain put upon them when in use.

k. Must have a double insulation from the ground. In wooden pole construction the pole will be considered as one insulation.

l. Must be capable of being disconnected at the power plant, or of being divided into sections, so that, in case of fire on the railway route, the current may be shut off from the particular section and not interfere with the work of the firemen. This rule also applies to feeders.

m. Must be safely protected against accidental contact where crossed by other conductors.

Guard wires should be insulated from the ground and should be electrically disconnected in sections of not more than 300 feet in length.

Ground Return Wires—

n. For the diminution of electrolytic corrosion of underground metal work, ground return wires must be so arranged that the difference of potential between the grounded dynamo terminal and any point on the return circuit will not exceed twenty-five volts.

It is suggested that the positive pole of the dynamo be connected to the trolley line, and that whenever pipes or other underground metal work are found to be electrically positive to the rails or surrounding earth, that they be connected by conductors arranged so as to prevent as far as possible current flow from the pipes into the ground.

13. Transformers—

(For construction rules, see No. 62.)

a. Must not be placed inside of any building, excepting central stations, unless by special permission of the inspection department having jurisdiction.

b. Must not be attached to the outside walls of buildings, unless separated therefrom by substantial supports.

CLASS C.—INSIDE WORK. ALL SYSTEMS AND VOLTAGES.

General Rules—All Systems and Voltages.

14. Wires—

(For special rules, see Nos. 18, 24, 32, 38 and 39.)

a. Must not be of smaller size than No. 14 B. & S., except as allowed under Rules 24 *t* and 45 *b*.

b. Tie wires must have an insulation equal to that of the conductors they confine.

c. Must be so spliced or joined as to be both mechanically and electrically secure without solder; they must then be soldered to insure preservation, and the joint covered with an insulation equal to that on the conductors.

Stranded wires must be soldered before being fastened under clamps or binding screws, and, when they have a conductivity greater than No. 10 B. & S. copper wire they must be soldered into lugs.

All joints must be soldered, even if made with some form of patent splicing device. This ruling applies to joints and splices in all classes of wiring covered by these rules.

d. Must be separated from contact with walls, floors, timbers or partitions through which they may pass by non-combustible, non-absorptive insulating tubes, such as glass or porcelain.

Bushings must be long enough to bush the entire length of the hole in one continuous piece, or else the hole must first be bushed by a continuous waterproof tube, which may be a conductor, such as iron pipe; the tube then is to have a non-conducting bushing pushed in at each end so as to keep the wire absolutely out of contact with the conducting pipe.

e. Must be kept free from contact with gas, water or other metallic piping, or any other conductors or conducting material which they may cross, by some continuous and firmly fixed non-conductor, creating a separation of at least one inch. Deviations from this rule may sometimes be allowed by special permission.

f. Must be so placed in wet places that air passage will be left between conductors and pipes in crossing, and the former must be run in such a way that they can not come in contact with the pipe accidentally. Wires should be run over, rather than under, pipes upon which moisture is likely to gather or which, by leaking, might cause trouble on a circuit.

15. Underground Conductors—

a. Must be protected, when brought into a building, against moisture and mechanical injury, and all combustible material must be kept removed from the immediate vicinity.

b. Must not be so arranged as to shunt the current through a building around any catch-box.

16. Table of Carrying Capacity of Wires—

Below is a table which must be followed in placing interior conductors, showing the allowable carrying capacity of wires and cables of ninety-eight per cent conductivity, according to the standard adopted by the American Institute of Electrical Engineers.

B. & S. G.	Table A. Rubber Cov'r'd Wires See No. 41. Amperes.	Table B. Weatherproof Wires See No. 42 to 44. Amperes.	Circular Mills.
18	3	5	1,624
16	6	8	2,583
14	12	16	4,107
12	17	23	6,530
10	24	32	10,380
8	33	46	16,510
6	46	65	26,250
5	54	77	33,100
4	65	92	41,740
3	76	110	52,630
2	90	131	66,370
1	107	156	83,690
0	127	185	105,500
00	150	220	133,100
000	177	262	167,800
0000	210	312	211,600
Circular Mills.			
200,000	200	300	
300,000	270	400	
400,000	330	500	
500,000	390	590	
600,000	450	680	
700,000	500	760	
800,000	550	840	
900,000	600	920	
1,000,000	650	1,000	
1,100,000	690	1,080	
1,200,000	730	1,150	
1,300,000	770	1,220	
1,400,000	810	1,290	
1,500,000	850	1,360	
1,600,000	890	1,430	
1,700,000	930	1,490	
1,800,000	970	1,550	
1,900,000	1,010	1,610	
2,000,000	1,050	1,670	

The lower limit is specified for rubber-covered wires to prevent gradual deterioration of the high insulations by the heat of the wires, but not from fear of igniting the insulation. The question of drop is not taken into consideration in the above tables.

The carrying capacity of sixteen and eighteen wire is given, but no smaller than fourteen is to be used, except as allowed under Rules 24 *t* and 45 *b*.

17. Switches, Cutouts, Circuit-Breakers, Etc.—

(For construction rules, see Nos. 51, 52 and 53.)

a. Must, whenever called for, unless otherwise provided (for exceptions, see No. 8 *c* and No. 22 *c*), be so arranged that the cutouts will protect, and the opening of the switch or circuit-breaker will disconnect, all of the wires; that is, in a two-wire system the two wires, and in a three-wire system the three wires, must be protected by the cutout and disconnected by the operation of the switch or circuit-breaker.

b. Must not be placed in the immediate vicinity of easily ignitable stuff or where exposed to inflammable gases or dust or to flyings of combustible material.

c. Must, when exposed to dampness, either be inclosed in a waterproof box or mounted on porcelain knobs.

CONSTANT-CURRENT SYSTEMS.

Principally Series Arc Lighting.

18. Wires—

(See also Nos. 14, 15 and 16.)

a. Must have an *approved* rubber insulating covering (see No. 41).

b. Must be arranged to enter and leave the building through an *approved* double-contact service switch (see No. 51), mounted in a non-combustible case, kept free from moisture, and easy of access to police or firemen. So-called "snap switches" must not be used on high-potential circuits.

c. Must always be in plain sight, and never incased, except when *required* by the inspection department having jurisdiction.

d. Must be supported on glass or porcelain insulators, which separate the wire at least one inch from the surface wired over, and must be kept *rigidly* at least eight inches from each other, except within the structure of lamps, on hanger-boards, in cutout boxes, or like places, where a less distance is necessary.

e. Must, on side walls, be protected from mechanical injury by a substantial boxing, retaining an air space of one inch around the conductors, closed at the top (the wires passing through bushed holes), and extending not less than seven feet from the floor. When crossing floor timbers in cellars or in rooms, where they might be exposed to injury, wires must be attached by their insulating supports to the under side of a wooden strip not less than one-half an inch in thickness.

19. Arc Lamps—

(For construction rules, see No. 57.)

a. Must be carefully isolated from inflammable material.

b. Must be provided at all times with a glass globe surrounding the arc, securely fastened upon a closed base. No broken or cracked globes to be used.

c. Must be provided with a wire netting (having a mesh not exceeding one and one-fourth inches) around the globe, and an *approved* spark arrester (see No. 58), when readily inflammable material is in the vicinity of the lamps, to prevent escape of sparks, melted copper or carbon. It is recommended that plain carbons, not copper-plated, be used for lamps in such places.

Arc lamps, when used in places where they are exposed to flyings of easily inflammable material, should have the carbons inclosed completely in a globe in such manner as to avoid the necessity for spark arresters.

For the present, globes and spark arresters will not be required on so-called "inverted arc" lamps, but this type of lamp must not be used where exposed to flyings of easily inflammable materials.

d. Where hanger-boards (see No. 56) are not used, lamps must be hung from insulating supports other than their conductors.

20. Incandescent Lamps in Series Circuits—

a. Must have the conductors installed as provided in No. 18, and each lamp must be provided with an automatic cutout.

b. Must have each lamp suspended from a hanger-board by means of rigid tube.

c. No electro-magnetic device for switches and no system of multiple-series or series-multiple lighting will be approved.

d. Under no circumstances can they be attached to gas fixtures.

CONSTANT-POTENTIAL SYSTEMS.

General Rules—All Voltages.

21. Automatic Cutouts (Fuses and Circuit-Breakers).

(See No. 17, and for construction, Nos. 52 and 53.)

a. Must be placed on all service wires, either overhead or underground, as near as possible to the point where they enter the building and inside the walls, and arranged to cut off the entire current from the building.

Where the switch required by rule No. 22 is inside the building, the cutout required by this section must be placed so as to protect it.

b. Must be placed at every point where a change is made in the size of wire (unless the cutout in the larger wire will protect the smaller, see No. 16).

c. Must be in plain sight, or inclosed in an *approved* box (see No. 54), and readily accessible. They must not be placed in the canopies or shells of fixtures.

d. Must be so placed that no set of incandescent lamps, whether grouped on one fixture or several fixtures or pendants, requiring more than 660 watts shall be dependent upon one cutout. Special permission may be given in writing by the inspection department having jurisdiction for departure from this rule in case of large chandeliers, stage borders and illuminated signs.

e. Must be provided with fuses, the rated capacity of which does not exceed the allowable carrying capacity of the wire, and, when circuit-breakers are used, they must not be set more than about thirty per cent above the allowable carrying capacity of the wire, unless a fusible cutout is also installed in the circuit (see No. 16).

22. Switches—

(See No. 17, and for construction, No. 51.)

a. Must be placed on all service wires, either overhead or underground, in a readily accessible place, as near as possible to the point where the wires enter the building, and arranged to cut off the entire current.

b. Must always be placed in dry, accessible places, and be grouped as far as possible. Knife switches must be so placed that gravity will tend to open rather than close the switch.

c. Must not be single-pole, except when the circuits which they control supply not more than six 16-candle-power lamps or their equivalent.

d. Where flush switches are used, whether with conduit systems or not, the switches must be inclosed in boxes constructed or lined with fire-resisting material. No push-buttons for bells, gas lighting circuits, or the like, shall be placed in the same wall-plate with switches controlling electric light or power wiring.

23. Electric Heaters—

a. Must, if stationary, be placed in a safe situation, isolated from inflammable materials, and be treated as sources of heat.

b. Must each have a cutout and *indicating* switch (see No. 17 *a*).

c. Must have the attachments of feed wires to the heaters in plain sight, easily accessible and protected from interference, accidental or otherwise.

d. The flexible conductors for portable apparatus, such as irons, etc., must have an *approved* insulating covering (see No. 45 *h*).

e. Must each be provided with name-plate, giving the maker's name and the normal capacity in volts and amperes.

LOW-POTENTIAL SYSTEMS.

300 Volts or Less.

Any circuit attached to any machine, or combination of machines, which develops a difference of potential, between any two wires, of over ten volts and less than 300 volts, shall be considered as a low-potential circuit, and as coming under this class, unless an approved transforming device is used, which cuts the difference of potential down to ten volts or less. The primary circuit not to exceed a potential of 3,500 volts.

24. Wires—

GENERAL RULES.

(See also Nos. 14, 15 and 16.)

a. Must not be laid in plaster, cement or similar finish.

b. Must never be fastened with staples.

c. Must not be fished for any great distance, and only in places where the inspector can satisfy himself that the rules have been complied with.

d. Twin wires must never be used, except in conduits, or where flexible conductors are necessary.

e. Must be protected on side walls from mechanical injury. When crossing floor timbers in cellars or in rooms, where they might be exposed to injury, wires must be attached by their insulating supports to the under side of a wooden strip, not less than one-half inch in thickness, and not less than three inches in width.

Suitable protection on side walls may be secured by a substantial boxing retaining an air space of one inch around the conductor, closed at the top (the wires passing through bushed holes), and extending not less than five feet from the floor; or by an iron-armored or metal-sheathed insulating conduit sufficiently strong to withstand the strain it will be subjected to; or plain metal pipe, lined with insulating tubing, which must extend one-half inch beyond the end of the metal tube.

The pipe must extend not less than five feet above the floor, and may extend through the floor in place of a floor bushing.

If iron pipes are used with alternating currents, the two or more wires of a circuit *must* be placed in the same conduit. In this case the insulation of each wire must be re-inforced by a tough conduit tubing projecting beyond the ends of the iron pipe at least two inches.

f. When run immediately under roofs, or in proximity to water tanks or pipes, will be considered as exposed to moisture.

SPECIAL RULES.

For Open Work (in dry places):

g. Must have an *approved* rubber or "slow-burning" weatherproof insulation (see Nos. 41 and 42).

h. Must be rigidly supported on non-combustible, non-absorptive insulators, which separate the wire at least one-half inch from the surface wired over, and they must be kept apart at least two and one-half inches.

Rigid supporting requires under ordinary conditions, where wiring along flat surfaces, supports at least every four and one-half feet. If the wires are liable to be disturbed, the distance between supports should be shortened. In buildings of mill construction, mains of No. 8 B. & S. wire or over, where not liable to be disturbed, may be separated about four inches, and run from timber to timber, not breaking around, and may be supported at each timber only.

This rule will not be interpreted to forbid the placing of the neutral of a three-wire system in the center of a three-wire cleat, provided the outside wires are separated two and one-half inches.

In damp places, such as Breweries, Sugar Houses, Packing Houses, Stables, Dye Houses, Paper or Pulp Mills, or buildings specially liable to moisture or acid or other fumes liable to injure the wires or their insulation, except where used for pendants:

i. Must have an *approved* rubber insulating covering (see No. 41).

j. Must be rigidly supported on non-combustible, non-absorptive insulators, which separate the wire at least one inch from the surface wired over, and they must be kept apart at least two and one-half inches.

Rigid supporting requires under ordinary conditions, where wiring over flat surfaces, supports at least every four and one-half feet. If the wires are liable to be disturbed, the distance between supports should be shortened. In buildings of mill construction, mains of No. 8 B. & S. wire or over, where not liable to be disturbed, may be separated about four inches, and run from timber to timber, not breaking around, and may be supported at each timber only.

k. Must have no joints or splices.

For Moulding Work:

l. Must have *approved* rubber insulating covering (see No. 41).

m. Must never be placed in moulding in concealed or damp places.

For Conduit Work:

n. Must have an *approved* rubber insulating covering (see No. 47).

o. Must not be drawn in until all mechanical work on the building has been, as far as possible, completed.

p. Must, for alternating systems, have the two or more wires of a circuit drawn in the same conduit.

It is advised that this be done for direct-current system also, so that they may be changed to alternating systems at any time, induction troubles preventing such a change unless this construction is followed.

For Concealed "Knob and Tube" Work:

q. Must have an *approved* rubber insulating covering (see No. 41).

r. Must be rigidly supported on non-combustible, non-absorptive insulators which separate the wire at least one inch from the surface wired over, and must be kept at least ten inches apart, and, when possible, should be run singly on separate timbers or studding.

Rigid supporting requires under ordinary conditions, where wiring along flat surfaces, supports at least every four and one-half feet. If the wires are liable to be disturbed, the distance between supports should be shortened.

s. When, from the nature of the case, it is impossible to place concealed wiring on non-combustible, insulating supports of glass or porcelain, an *approved* armored cable, single or twin conductors (see No. 48), may be used if it is installed without joints between outlets, and the cable armor properly enters all fittings and is rigidly secured in place; or, if the wires are not exposed to moisture, they may be fished on the loop system if separately incased throughout in approved flexible tubing or conduits.

For Fixture Work:

t. Must have an *approved* rubber insulating covering (see No. 46), and shall not be less in size than No. 18 B. & S.

u. Supply conductors, and especially the splices to fixture wires, must be kept clear of the grounded part of gas-pipes, and, where shells are used, the latter must be constructed in a manner affording sufficient area to allow this requirement.

v. Must, when fixtures are wired outside, be so secured as not to be cut or abraided by the pressure of the fastenings or motion of the fixture.

25. Interior Conduits—

(See also Nos. 24 *n* to *p*, and 49.)

The object of a tube or conduit is to facilitate the insertion or extraction of the conductors to protect them from mechanical injury and, as far as possible, from moisture. Tubes or conduits are to be considered merely as raceways, and are not to be relied upon for insulation between wire and wire, or between the wire and the ground.

a. No conduit tube having an internal diameter of less than five-eights of an inch shall be used. (If conduit is lined, measurement to be taken inside of lining.)

b. Must be continuous from one junction box to another or to fixtures, and the conduit tube must properly enter all fittings.

c. Must be first installed as a complete conduit system, without the conductors.

d. Must be equipped at every outlet with an *approved* outlet box.

e. Metal conduits, where they enter junction boxes, and at all other outlets, etc., must be fitted with a capping of *approved* insulating material, fitted so as to protect wire from abrasion.

f. Must have the metal of the conduit permanently and effectually grounded.

26. Fixtures—

(See also No. 24 *t* to *v*.)

a. Must, when supported from the gas-piping of a building, be insulated from the gas-pipe system by means of *approved* insulating joints (see No. 59) placed as close as possible to the ceiling.

It is recommended that the gas outlet pipe be protected above the insulating joint by a non-combustible, non-absorptive, insulating tube, having a flange at the lower end where it comes in contact with the insulating joint; and that, where outlet tubes are used, they be of sufficient length to extend below the insulating joint, and that they be so secured that they will not be pushed back when the canopy is put in place. Where iron ceilings are used, care must be taken to see that the canopy is thoroughly and permanently insulated from the ceiling.

b. Must have all burs, or fins, removed before the conductors are drawn into the fixture.

c. The tendency to condensation within the pipes should be guarded against by sealing the upper end of the fixture.

d. No combination fixture in which the conductors are concealed in a space less than one-fourth inch between the inside pipe and the outside casing will be approved.

e. Must be tested for "contacts" between conductors and fixture, for "short circuits" and for ground connections before it is connected to its supply conductors.

f. Ceiling blocks for fixtures should be made of insulating material; if not, the wires in passing through the plate must be surrounded with non-combustible, non-absorptive, insulating material, such as glass or porcelain.

27. Sockets—

(For construction rules, see No. 55.)

a. In rooms where inflammable gases may exist the incandescent lamp and socket must be inclosed in a vapor-tight globe, and supported on a pipe-hanger, wired with *approved* rubber-covered wire (see No. 41) soldered directly to the circuit.

b. In damp or wet places, or over specially inflammable stuff, waterproof sockets must be used.

When waterproof sockets are used, they should be hung by separate stranded rubber-covered wires, not smaller than No. 14 B. & S., which should preferably be twisted together when the drop is over three feet. These wires should be soldered direct to the circuit wires, but supported independently of them.

28. Flexible Cord—

a. Must have an *approved* insulation and covering (see No. 45).

b. Must not be used as a support for clusters.

c. Must not be used except for pendants, wiring of fixtures and portable lamps or motors.

d. Must not be used in show windows.

e. Must be protected by insulating bushings where the cord enters the socket.

f. Must be so suspended that the entire weight of the socket and lamp will be borne by knots under the bushing in the socket, and above the point where the cord comes through the ceiling block or rosette, in order that the strain may be taken from the joints and binding screws.

29. Arc Lights on Low-Potential Circuits—

a. Must have a cutout (see No. 17 *a*) for each lamp or each series of lamps.

The branch conductors should have a carrying capacity about fifty per cent. in excess of the normal current required by the lamp to provide for heavy current required when lamp is started or when carbons become stuck without overfusing the wires.

b. Must only be furnished with such resistances or regulators as are inclosed in non-combustible material, such resistances being treated as sources of heat. Incandescent lamps must not be used for resistance devices.

c. Must be supplied with globes and protected by spark arresters and wire netting around globe, as in the case of arc lights on high-potential circuits (see Nos. 19 and 58).

30. Economy Coils—

a. Economy and compensator coils for arc lamps must be mounted on non-combustible, non-absorptive insulating supports, such as glass or porcelain, allowing an air space of at least one inch between frame and support, and in general to be treated like sources of heat.

31. Decorative Series Lamps—

a. Incandescent lamps run in series shall not be used for decorative purposes inside of buildings, except by special permission in writing from the inspection department having jurisdiction.

HIGH-POTENTIAL SYSTEMS.

300 to 3,500 Volts.

Any circuit attached to any machine, or combination of machines, which develops a difference of potential, between any two wires, of over 300 volts and less than 3,500 volts, shall be considered as a high-potential circuit, and as coming under that class, unless an approved transforming device is used, which cuts the difference of potential down to 300 volts or less.

32. Wires—

(See also Nos. 14, 15 and 16.)

a. Must have an *approved* rubber-insulating covering (see No. 41).

b. Must always be in plain sight and never incased, except where required by the inspection department having jurisdiction.

c. Must be rigidly supported on glass or porcelain insulators, which raise the wire at least one inch from the surface wired over, and must be kept apart at least four inches for voltages up to 750 and at least eight inches for voltages over 750.

Rigid supporting requires under ordinary conditions, where wiring along flat surfaces, supports at least about every four and one-half feet. If the wires are unusually liable to be disturbed, the distance between supports should be shortened.

In buildings of mill construction, mains of No. 8 B. & S. wire or over, where not liable to be disturbed, may be separated about six inches for voltages up to 750 and about ten inches for voltages above 750; and run from timber to timber, not breaking around, and may be supported at each timber only.

d. Must be protected on side walls from mechanical injury by a substantial boxing, retaining an air space of one inch around the conductors, closed at the top (the wires passing through bushed holes) and extending not less than seven feet from the floor. When crossing floor timbers, in cellars or in rooms, where they might be exposed to injury, wires must be attached by their insulating supports to the under side of a wooden strip not less than one-half an inch in thickness.

33. Transformers (When permitted inside buildings, see No. 13)—

(For construction rules, see No. 62.)

a. Must be located at a point as near as possible to that at which the primary wires enter the building.

b. Must be placed in an inclosure constructed of or lined with fire-resisting material; the inclosure to be used only for this purpose, and to be kept securely locked and access to the same allowed only to responsible persons.

c. Must be effectually insulated from the ground, and the inclosure in which they are placed must be practically air tight, except that it shall be thoroughly ventilated to the outdoor air, if possible, through a chimney or flue. There should be at least six inches air space on all sides of the transformer.

34. Car Wiring—

a. Must be always run out of reach of the passengers, and must have an *approved* rubber-insulating covering (see No. 41).

35. Car Houses—

a. Must have the trolley wires securely supported on insulating hangers.

b. Must have the trolley hangers placed at such distance apart that, in case of a break in the trolley wire, contact can not be made with the floor.

c. Must have cutout switch located at a proper place outside of the building, so that all trolley circuits in the building can be cutout at one point, and line circuit-breakers must be installed, so that when this cutout switch is open the trolley wire will be dead at all points within 100 feet of the building. The current must be cut out of the building whenever the same is not in use or the road not in operation.

d. Must have all lamps and stationary motors installed in such a way that one main switch can control the whole of each installation—lighting or power—independently of main feeder-switch. No portable incandescent lamps or twin wire allowed, except that portable incandescent lamps may be used in the pits, connections to be made by two *approved* rubber-covered flexible wires (see No. 41), properly protected against mechanical injury; the circuit to be controlled by a switch placed outside of the pit.

e. Must have all wiring and apparatus installed in accordance with rules under Class "C" for constant-potential systems.

f. Must not have any system of feeder distribution centering in the building.

g. Must have the rails bonded at each joint with not less than No. 2 B. & S. annealed copper wire; also a supplementary wire to be run for each track.

h. Must not have cars left with trolley in electrical connection with the trolley wire.

36. Lighting and Power from Railway Wires—

a. Must not be permitted, under any pretense, in the same circuit with trolley wires with a ground return, except in electric railway cars, electric car houses and their power stations; nor shall the same dynamo be used for both purposes.

37. Series Lamps—

a. No system of multiple-series or series-multiple for light or power will be approved.

b. Under no circumstances can lamps be attached to gas fixtures.

EXTRA HIGH-POTENTIAL SYSTEMS.

Over 3,500 Volts.

Any circuit attached to any machine, or combination of machines, which develops a difference of potential, between any two wires, of over 3,500 volts, shall be considered as an extra high-potential circuit, and as coming under that class, unless an approved transforming device is used, which cuts the difference of potential down to 3,500 volts or less.

38. Primary Wires—

a. Must not be brought into or over building, except power and substations.

39. Secondary Wires—

a. Must be installed under rules for high-potential systems, when their immediate primary wires carry a current at a potential of over 3,500 volts, unless the primary wires are entirely underground.

The presence of wires carrying a current at a potential of over 3,500 volts in the streets of cities and towns is considered as increasing the fire hazard.

CLASS D.—FITTINGS, MATERIALS AND DETAILS OF CONSTRUCTION.

All Systems and Voltages.

Insulated Wires—Rules 40 to 48.

40. General Rules—

a. Copper for insulated conductors must never vary in diameter so as to be more than two one-thousandths of an inch less than the specified size.

b. Wires and cables of all kinds designed to meet the following specifications must be plainly tagged or marked as follows:

1. The maximum voltage at which the wire is designed to be used.
2. The words "National Electrical Code Standard."
3. Name of the manufacturing company and, if desired, trade name of the wire.
4. Month and year when manufactured.

41. Rubber Covered—

a. Copper for conductors must be thoroughly tinned.

Insulation for Voltages Between 0 and 600:

b. Must be of rubber or other approved substance, and be of a thickness not less than given in the following table for B. & S. gage sizes:

From	18 to	16, inclusive,	$\frac{1}{38}''$
"	14 to	8, "	$\frac{0}{64}''$
"	7 to	2, "	$\frac{1}{46}''$
"	1 to	0000, "	$\frac{5}{64}''$
"	0000 to	500,000, C. M.,	$\frac{3}{36}''$
"	500,000 to	1,000,000, "	$\frac{7}{64}''$
Larger than		1,000,000, "	$\frac{1}{8}''$

Measurements of insulating wall are to be made at the thinnest portion of the dielectric.

c. The completed coverings must show an insulation resistance of at least 100 megohms per mile during thirty days' immersion in water at seventy degrees Fahrenheit.

d. Each foot of the completed covering must show a dielectric strength sufficient to resist throughout five minutes the application of an electro-motive force of 3,000 volts per one-sixty-fourth of an inch thickness of insulation under the following conditions:

The source of alternating electro-motive force shall be a transformer of at least one kilowatt capacity. The application of the electro-motive force shall first be made at 4,000 volts for five minutes, and then the voltage increased by steps of not over 3,000 volts, each held for five minutes, until the rupture of the insulation occurs. The tests for dielectric strength shall be made on a sample of wire which has been immersed for seventy-two hours in water, one foot of which is submerged in a conducting liquid held in a metal trough, one of the transformer terminals being connected to the copper of the wire, and the other to the metal of the trough.

Insulations for Voltages Between 600 and 3,500:

e. The thickness of the insulating walls must not be less than those given in the following table for B. & S. gage sizes:

From 14 to 1, inclusive, $\frac{3}{32}''$

From 0 to 500,000, C. M., $\frac{3}{32}''$ covered by a tape or a braid.

Larger than 500,000, C. M., $\frac{4}{32}''$ covered by a tape or a braid.

f. The requirements as to insulation and break-down resistance for wires for low-potential systems shall apply, with the exception that an insulation resistance of not less than 300 megohms per mile shall be required.

Insulations for Voltages Over 3,500:

g. Wire for arc-light circuits exceeding 3,500 volts potential shall have an insulating wall not less than six-thirty-seconds of an inch in thickness, and shall withstand a break-down test of at least 30,000 volts and have an insulation of at least 500 megohms per mile.

The tests on this wire to be made under the same conditions as for low-potential wires.

Specifications for insulations for alternating currents exceeding 3,500 volts have been considered, but on account of the somewhat complex conditions in such work, it has so far been deemed inexpedient to specify general insulations for this use.

h. All of the above insulations must be protected by a substantial braided covering properly saturated with a preservative compound and sufficiently strong to withstand all the abraision likely to be met with in practice, and sufficiently elastic to permit all wires smaller than No. 7 B. & S. gage to be bent around a cylinder with twice the diameter of the wire, without injury to the braid.

42. Slow-Burning Weatherproof—

a. The insulation shall consist of two coatings, the inner one to be fireproof in character, the outer to be weatherproof. The inner fireproof coating must comprise at least six-tenths of the total thickness of the wall. The completed covering must be of a thickness not less than that given in the following table for B. & S. gage sizes:

From	14 to	8, inclusive,	$\frac{3}{64}''$
"	7 to	2, "	$\frac{1}{16}''$
"	2 to	0000, "	$\frac{5}{64}''$
"	0000 to	500,000, C. M.,	$\frac{3}{32}''$
"	500,000 to	1,000,000, "	$\frac{7}{64}''$
Larger than		1,000,000, "	$\frac{1}{8}''$

Measurements of insulating wall are to be made at the thinnest portion of the dielectric.

b. The inner fireproof coating shall be layers of cotton or other thread, the outer one of which must be braided. All the interstices of these layers are to be filled with the fireproofing compound. This is to be material whose solid constituent is not susceptible to moisture, and which will not burn even when ground in an oxidizable oil, making a compound which, while proof against fire and moisture, at the same time has considerable elasticity, and which when dry will suffer no change at a temperature of 250 degrees Fahrenheit, and which will not burn at even higher temperature.

c. The weatherproof coating shall be a stout braid thoroughly saturated with a dense moistureproof compound thoroughly slicked down, applied in such manner as to drive any atmospheric moisture from the cotton braiding, thereby securing a covering to a great degree waterproof and of high insulating power. This compound to retain its elasticity at zero Fahrenheit, and not drip at 160 degrees Fahrenheit.

This wire is not as burnable as the old "weatherproof," nor as subject to softening under heat, but still is able to repel the ordinary amount of moisture found indoors. It would not usually be used for outside work.

43. Slow-Burning—

a. The insulation shall be the same as the "slow-burning weatherproof," except that the outer braiding shall be impregnated with a fireproofing compound similar to that required for the interior layers, and with the outer surface finished smooth and hard.

This "slow-burning" wire shall only be used with special permission of the inspection department having jurisdiction.

This is practically the old "Underwriters' " insulation. It is specially useful in hot, dry places where ordinary insulations would perish, also where wires are bunched, as on the back of a large switchboard or in a wire tower, so that the accumulation of rubber or weatherproof insulation would result in an objectionably large mass of highly inflammable material.

Its use is restricted, as its insulating qualities are not high and are damaged by moisture.

44. Weatherproof—

a. The insulating covering shall consist of at least three braids thoroughly impregnated with a dense moisture repellant, which will not drip at a temperature lower than 180 degrees Fahrenheit. The thickness of insulation shall not be less than that of "slow-burning weatherproof." The outer surface shall be thoroughly slicked down.

This wire is for outdoor use where moisture is certain and where fireproof qualities are not necessary.

45. Flexible Cord—

a. Must be made of stranded copper conductors, each strand to be not larger than No. 26 or smaller than No. 30 B. & S. gage, and each stranded conductor must be covered by an approved insulation and protected from mechanical injury by a tough, braided outer covering.

For Pendant Lamps:

In this class is to be included all flexible cord which, under usual conditions, hangs freely in air, and which is not likely to be moved sufficiently to come in contact with surrounding objects.

b. Each stranded conductor must have a carrying capacity equivalent to not less than a No. 18 B. & S. gage wire.

c. The covering of each stranded conductor must be made up as follows:

1. A tight, close wind of fine cotton.
2. The insulation proper, which shall be either waterproof or slow-burning.
3. An outer cover of silk or cotton.

The wind of cotton tends to prevent a broken strand puncturing the insulation and causing a short circuit. It also keeps the rubber from corroding the copper.

d. Waterproof insulation must be solid, at least one-thirty-second of an inch thick, and must show an insulation resistance of fifty megohms per mile throughout two weeks' immersion in water at 70 degrees Fahrenheit, and stand the tests prescribed for low-tension wires as far as they apply.

e. Slow-burning insulation must be at least one-thirty-second of an inch in thickness and composed of substantial, elastic, slow-burning materials, which will suffer no damage at a temperature of 250 degrees Fahrenheit.

f. The outer protecting braiding should be so put on and sealed in place that when cut it will not fray out, and where cotton is used, it should be impregnated with a flameproof paint, which will not have an injurious effect on the insulation.

For Portables:

In this class is included all cord used on portable lamps, small portable motors, etc.

g. Flexible cord for portable use must have waterproof insulation, as required in section *d* for pendant cord, and in addition be provided with a reinforcing cover especially designed to withstand the abraision it will be subject to in the uses to which it is to be put.

For Portable Heating Apparatus:

h. Must be made up as follows:

1. A tight, close wind of fine cotton.
2. A thin layer of rubber about one-one-hundredth of an inch thick, or other cementing material.
3. A layer of asbestos insulation at least three-sixty-fourths of an inch thick.
4. A stout braid of cotton.
5. An outer reinforcing cover especially designed to withstand abraision.

This cord is in no sense waterproof, the thin layer of rubber being specified in order that it may serve merely as a seal to help hold in place the fine cotton and asbestos, and it should be so put on as to accomplish this.

46. Fixture Wire—

a. Must have a solid insulation, with a slow-burning, tough, outer covering, the whole to be at one-thirty-second of an inch in thickness, and show an insulation resistance between conductors and between either conductor and the ground of at least one megohm per mile, after one week's submersion in water at seventy degrees Fahrenheit, and after three minutes' electrification, with 550 volts.

47. Conduit Wire—

Must comply with the following specifications:

a. For metal conduits, having a lining of insulating material, single wires must comply with No. 41, and all duplex, twin and concentric conductors must comply with No. 41, and must also have each conductor separately braided or taped and a substantial braid covering the whole.

b. For unlined metal conduits, conductors must conform to the specifications given for lined conduits, and in addition have a second outer fibrous covering at least one-thirty-second of an inch in thickness, and sufficiently tenacious to withstand the abraision of being hauled through the metal conduit.

The braid required around each conductor in duplex, twin and concentric cables is to hold the rubber insulation in place and prevent jamming and flattening.

48. Armored Cable—

a. The armor of such cables must be at least equal in thickness and of equal strength to resist penetration by nails, etc., as the armor of metal coverings of metal conduits (see No. 49 *b*).

b. The conductors in same, single wire or twin conductors, must have an insulating covering as required by No. 41, any filler used to secure a round exterior must be impregnated with a moisture repellant, and the whole bunch of conductors and fillers must have a separate exterior covering of insulating material at least one-thirty-second of an inch in thickness, conforming to the insulation standard given in No. 41 and covered with a substantial braid.

Very reliable insulation is specified, as such cables are liable to hard usage, and in part of their length may be subject to moisture, while they may not be easily removable, so that a breakdown of insulation is likely to be expensive.

49. Interior Conduits—

(For wiring rules, see Nos. 24 and 25.)

a. Each length of conduit, whether insulated or uninsulated, must have the maker's name or initials stamped in the metal or attached thereto in a satisfactory manner, so that the inspectors can readily see the same.

Metal Conduits with Lining of Insulating Material:

b. The metal covering or pipe must be equal in strength to the ordinary commercial forms of gas-pipe of the same size, and its thickness must be not less than that of standard gas-pipe, as shown by the following table:

Size. Inches.	Thickness of Wall—Inches.	Size. Inches.	Thickness of Wall—Inches.
½	.109	1¼	.140
⅝	111	1½	.145
¾	.113	2	.154
1	.134		

An allowance of two-one-hundredths of an inch for variation in manufacturing and loss of thickness by cleaning will be permitted.

c. Must not be seriously affected externally by burning out a wire inside the tube when the iron pipe is connected to one side of the circuit.

d. Must have the insulating lining firmly secured to the pipe.

e. The insulating lining must not crack or break when a length of the conduit is uniformly bent at temperature of 212 degrees Fahrenheit to an angle of ninety degrees, with a curve having a radius of fifteen inches, for pipes of one inch and less, and fifteen times the diameter of pipe for larger pipes.

f. The insulating lining must not soften injuriously at a temperature below 212 degrees Fahrenheit, and must leave water in which it is boiled practically neutral.

g. The insulating lining must be at least one-thirty-second of an inch in thickness, and the materials of which it is composed must be of such a nature as will not have a deteriorating effect on the insulation of the conductor, and be sufficiently tough and tenacicus to withstand the abraision test of drawing long lengths of conductors in and out of the same.

h. The insulating lining must not be mechanically weak after three days' submersion in water, and when removed from the pipe entire, must not absorb more than ten per cent of its weight of water during 100 hours of submersion.

i. All elbows or bends must be so made that the conduit or lining of same will not be injured. The radius of the curve of the inner edge of any elbow not to be less than three and one-half inches. Must have not more than the equivalent of four quarter bends from outlet to outlet, the bends at the outlets not being counted

Unlined Metal Conduits.

j. Plain iron or steel pipes of equal thickness and strengths specified for lined conduits in No. 49 *b* may be used as conduits, provided their interior surfaces are smooth and free from burs; pipe to be galvanized, or the interior surfaces coated or enameled, to prevent oxidation, with some substance which will not soften so as to become sticky and prevent wire from being withdrawn from the pipe.

k. All elbows or bends must be so made that the conduit will not be injured. The radius of the curve of the inner edge of any elbow not to be less than three and one-half inches. Must have not more than the equivalent of four quarter bends from outlet to outlet, the bends at the outlet not being counted.

50. Wooden Mouldings—

(For wiring rules, see No. 24.)

a. Must have, both outside and inside, at least two coats of waterproof paint, or be impregnated with a moisture repellant.

b. Must be made of two pieces, a backing and capping so constructed as to thoroughly incase the wire, and provide a one-half-inch tongue between the conductors, and a solid backing, which, under grooves, shall not be less than three-eighths of an inch in thickness, and must afford suitable protection from abraision.

It is recommended that only hardwood moulding be used.

51. Switches—

(See Nos. 17 and 22.)

a. Must be mounted on non-combustible, non-absorptive, insulating bases, such as slate or porcelain.

b. Must have carrying capacity sufficient to prevent undue heating.

c. Must, when used for service switches, indicate, on inspection, whether the current be "on" or "off."

d. Must be plainly marked where it will always be visible, with the name of the maker and the current and voltage for which the switch is designed.

e. Must, for constant-potential systems, operate successfully at fifty per cent overload in amperes, with twenty-five per cent excess voltage under the most severe conditions they are liable to meet with in practice.

f. Must, for constant-potential systems, have a firm and secure contact; must make and break readily, and not stop when motion has once been imparted by the handle.

g. Must, for constant-current systems, close the main circuit and disconnect the branch wires when turned "off;" must be so constructed that they shall be automatic in action, not stopping between points when started, and must prevent an arc between the points under all circumstances. They must indicate, upon inspection, whether the current be "on" or "off."

52. Cutouts and Circuit-Breakers—

(For installation rules, see Nos. 17 and 21.)

a. Must be supported on bases of non-combustible, non-absorptive insulating material.

b. Cutouts must be provided with covers, when not arranged in approved cabinets, so as to obviate any danger of the melted fuse metal coming in contact with any substance which might be ignited thereby.

c. Cutouts must operate successfully, under the most severe conditions they are liable to meet with in practice, on short circuits with fuses rated at fifty per cent above and with a voltage twenty-five per cent above the current and voltage for which they are designed.

d. Circuit-breakers must operate successfully, under the most severe conditions they are liable to meet with in practice, on short circuits when set at fifty per cent above the current, and with a voltage twenty-five per cent above that for which they are designed.

e. Must be plainly marked where it will always be visible, with the name of the maker, and current and voltage for which the device is designed.

53. Fuses—

(For installation rules, see Nos. 17 and 21.)

a. Must have contact surfaces or tips of harder metal having perfect electrical connection with the fusible part of the strip.

b. Must be stamped with about eighty per cent of the maximum current they can carry indefinitely, thus allowing about twenty-five per cent overload before fuse melts.

With naked open fuses, of ordinary shapes and not over 500 amperes capacity, the *maximum* current which will melt them in about five minutes may be safely taken as the melting point, as the fuse practically reaches its maximum temperature, in this time. With larger fuses a longer time is necessary.

Enclosed fuses where the fuse is often in contact with substances having good conductivity to heat, and often of considerable volume, require a much longer time to reach a maximum temperature on account of the surrounding material which heats up slowly.

These data are given to facilitate testing.

c. Fuse terminals must be stamped with the maker's name, initials, or some known trade-mark.

54. Cutout Cabinets—

a. Must be so constructed, and cutouts so arranged, as to obviate any danger of the melted fuse metal coming in contact with any substance which might be ignited thereby.

A suitable box can be made of marble, slate or wood, strongly put together, the door to close against a rabbit so as to be perfectly dust-tight, and it should be hung on strong hinges and held closed by a strong hook or catch. If the box is wood, the inside should be lined with sheets of asbestos board about one-sixteenth of an inch in thickness, neatly put on and firmly secured in place by shellac and tacks. The wires should enter through holes bushed with porcelain bushings; the bushings tightly fitting the holes in the box, and the wires tightly fitting the bushings (using tape to build up the wire, if necessary) so as to keep out the dust.

55. Sockets—

(See No. 27.)

Sockets of all kinds, including wall receptacles, must be constructed in accordance with the following specifications.

a. Standard Sizes—The standard lamp socket shall be suitable for use on any voltage not exceeding 250, and with any size lamp up to fifty candle-power. For lamps larger than fifty candle-power a standard keyless socket may be used, or if a key is required, a special socket designed for the current to be used must be made. Any special sockets must follow the general spirit of these specifications.

b. Marking—The standard socket must be plainly marked fifty candle-power, 250 volts, and with either the manufacturer's name or registered trade-mark. Special large sockets must be marked with the current and voltage for which they are designed.

c. Shell—Metal used for shells must be moderately hard, but not hard enough to be brittle or so soft as to be easily dented or knocked out of place. Brass shells must be at least 0.013 inch in thickness. and shells of any other material must be thick enough to give the same stiffness and strength of brass.

d. Lining—The inside of the shells must be lined with insulating material, which shall absolutely prevent the shell from becoming a part of the circuit, even though the wires inside the socket should start from their position under binding screws.

The material used for lining must be at least one-thirty-second of an inch in thickness, and must be tough and tenacious. It must not be injuriously affected by the heat from the largest lamp permitted in the socket, and must leave the water in which it is boiled practically neutral. It must be so firmly secured to the shell that it will not fall out with ordinary handling of the socket. It is preferable to have the lining in one piece.

e. Cap—Caps when of sheet brass must be at least 0.013 inch in thickness, and when cast or made of other metals must be of equivalent strength. The inlet piece, except for special sockets, must be tapped and threaded for ordinary one-eighth-inch pipe. It must contain sufficient metal for a full, strong thread, and, when not of the same piece as the cap, must be joined to it in a way to give the strength of a single piece.

There must be sufficient room in the cap to enable the ordinary wireman to easily and quickly make a knot in the cord and push it into place in cap without crowding. All parts of the cap upon which the knot is likely to bear must be smooth and well insulated.

f. Frame and Screws—The frame holding moving parts must be sufficiently heavy to give ample strength and stiffness.

Brass pieces containing screw threads must be at least 0.06 of an inch in thickness.

Binding post screws must not be smaller than No. 5 wire and about forty threads per inch.

g. Spacing—Points of opposite polarity must everywhere be kept not less than three-sixty-fourths of an inch apart unless separated by a reliable insulation.

h. Connections—The connecting points for the flexible cord must be made to very securely grip a No. 16 or 18 B. & S. conductor. A turned-up lug, arranged so that the cord may be gripped between the screw and the lug in such a way that it can not possibly come out, if strongly advised.

i. Lamp Holder—The socket must firmly hold the lamp in place so that it can not be easily jarred out, and must provide a contact good enough to prevent undue heating with maximum current allowed. The holding pieces, springs and the like, if a part of the circuit, must not be sufficiently exposed to allow them to be brought in contact with anything outside of lamp and socket.

j. Base—The inside parts of the socket, which are of insulating material, except the lining, must be made of porcelain.

k. Key—The socket key-handle must be of such a material that it will not soften from the heat of a fifty-candle-power lamp hanging downwards in air at seventy degrees Fahrenheit from the socket, and must be securely, but not necessarily rigidly, attached to the metal spindle it is designed to turn.

l. Sealing—All screws in porcelain pieces, which can be firmly sealed in place, must be so sealed by a waterproof compound which will not melt below 200 degrees Fahrenheit.

m. Putting Together—The socket must, as a whole, be so put together that it will not rattle to pieces. Bayonet joints or equivalent are recommended.

n. Test—The socket when slowly turned "on and off," at the rate of about two or three times per minute, must "make and break" the circuit 6,000 times before failing, when carrying a load of one ampere at 220 volts.

o. Keyless Sockets—Keyless sockets of all kinds must comply with requirements for key sockets as far as they apply.

p. Sockets of Insulating Materials—Sockets made of porcelain or other insulating material must conform to the above requirements as far as they apply, and all parts must be strong enough to withstand a moderate amount of hard usage without breaking.

q. Inlet Bushing—When the socket is not attached to fixtures the threaded inlet must be provided with a strong insulating bushing having a *smooth* hole of at least fifteen-sixty-fourths of an inch in diameter. The corners of the bushing must be rounded and all inside fins removed, so that in no place will the cord be subjected to the cutting or wearing action of a sharp edge.

56. Hanger-Boards—

a. Hanger-boards must be so constructed that all wires and current-carrying devices thereon shall be exposed to view and thoroughly insulated by being mounted on a non-combustible, non-absorptive insulating substance. All switches attached to the same must be so constructed that they shall be automatic in their action, cutting off both poles to the lamp, not stopping between points when started and preventing an arc between points under all circumstances.

57. Arc Lamps—

(For installation rules, see No. 19.)

a. Must be provided with reliable stops to prevent carbons from falling out in case the clamps become loose.

b. Must be carefully insulated from the circuit in all their exposed parts.

c. Must, for constant-current systems, be provided with an *approved* hand switch, also an automatic switch that will shunt the current around the carbons, should they fail to feed properly.

The hand switch to be approved, if placed anywhere except on the lamp itself, must comply with requirements for switches on hanger-boards, as laid down in No. 56.

58. Spark Arresters—

(See No. 19 *c.*)

a. Spark arresters must so close the upper orifice of the globe that it will be impossible for any sparks, thrown off by the carbons, to escape.

59. Insulating Joints—

(See No. 26 *a.*)

a. Must be entirely made of material that will resist the action of illuminating gases, and will not give way or soften under the heat of an ordinary gas flame or leak under a moderate pressure. They shall be so arranged that a deposit of moisture will not destroy the insulating effect, and shall have an insulating resistance of at least 250,000 ohms between the gas-pipe attachments, and be sufficiently strong to resist the strain they will be liable to be subjected to in being installed.

b. Insulating joints having soft rubber in their construction will not be approved.

60. Resistance Boxes and Equalizers—

(For installation rules, see No. 4.)

a. Must be equipped with metal, or with other non-combustible frames.

The word "frame" in this section relates to the entire case and surroundings of the rheostat, and not alone to the upholding supports.

61. Reactive Coils and Condensers—

a. Reactive coils must be made of non-combustible material, mounted on non-combustible bases and treated, in general, like sources of heat.

b. Condensers must be treated like apparatus operating with equivalent voltage and currents. They must have non-combustible cases and supports, and must be isolated from all combustible materials and, in general, treated like sources of heat.

62. Transformers—

(For installation rules, see Nos. 11, 13 and 33.)

a. Must not be placed in any but metallic or other non-combustible cases.

b. Must be constructed to comply with the following tests:

1. Shall be run for eight consecutive hours at full load in watts under conditions of service, and at the end of that time the rise in temperature, as measured by the increase of resistance of the primary coil, shall not exceed 135 degrees Fahrenheit.
2. The insulation of transformers when heated shall withstand continuously for five minutes a difference of potential of 10,000 volts (alternating) between primary and secondary coils and between the primary coils and core, and a no-load "run" at double voltage for thirty minutes.

63. Lightning Arresters—

(For installation rules, see No. 5.)

a. Must be mounted on non-combustible bases, and must be so constructed as not to maintain an arc after the discharge has passed and must have no moving parts.

CLASS E.—MISCELLANEOUS.

64. Signaling Systems (Governing wiring for telephone, telegraph, district messenger and call-bell circuits, fire and burglar alarms and all similar systems)—

a. Outside wires should be run in underground ducts or strung on poles, and, so far as possible, kept off of buildings, and must not be placed on the same cross-arm with electric light or power wires.

b. When outside wires are run on same pole with electric light or power wires, the distance between the two inside pins of each cross-arm must not be less than twenty-six inches.

c. All aerial conductors and underground conductors which are directly connected to aerial wires must be provided with some approved protective device, which shall be located as near their point of entrance to the building as possible, and not less than six inches from curtains or other inflammable material.

d. If the protector is placed inside of building, wires, from outside support to binding-posts of protector, shall comply with the following requirements:

1. Must be of copper, and not smaller than No. 16 B. & S. gauge.
2. Must have an *approved* rubber insulating covering (see No. 41).
3. Must have drip loops in each wire immediately outside the building.
4. Must enter building through separate holes sloping upward from the outside; when practicable, holes to be bushed with non-absorptive, non-combustible insulating tubes extending through their entire length. Where tubing is not practicable, the wires shall be wrapped with two layers of insulating tape.
5. Must be supported on porcelain insulators, so that they will not come in contact with anything other than their designed supports.
6. A separation between wires of at least two and one-half inches must be maintained.

In case of crosses these wires may become a part of a high-voltage circuit, so that similar care to that given high-voltage circuits is needed in placing them. Reliable porcelain bushings at the entrance holes are desirable, and are only waived under adverse conditions, because the state of the art in this type of wiring makes an absolute requirement inadvisable.

e. The ground wire of the protective device shall be run in accordance with the following requirements:

1. Shall be of copper, and not smaller than No. 16 B. & S.
2. Must have an *approved* rubber insulating covering (see No. 41).
3. Shall run in as straight a line as possible to a good, permanent ground, to be made by connecting to water or gas-pipe, preferably water-pipe. If gas-pipe is used, the connection, in all cases, must be made between the meter and service pipes. In the absence of other good ground, the ground shall be made by means of a metallic plate or bunch of wires buried in permanently moist earth.
4. Shall be kept at least three inches from all other conductors and supported on porcelain insulators, so as not to come in contact with anything other than its designed supports.

In attaching a ground wire to a pipe, it is often difficult to make a thoroughly reliable solder joint. It is better, therefore, where possible, to carefully solder the wire to a brass plug, which may then be firmly screwed into a pipe fitting.

Where such joints are made under ground they should be thoroughly painted and taped to prevent corrosion.

f. The protector to be approved must comply with the following requirements:

1. Must be mounted on non-combustible, non-absorptive insulating bases, so designed that when the protector is in place, all parts which may be alive will be thoroughly insulated from the wall holding the protector.
2. Must have the following parts:
   A lightning arrester which will operate with a difference of potential between wires of not over 500 volts, and so arranged that the chance of accidental grounding is reduced to a minimum.
   A fuse designed to open the circuit in case the wires become crossed with light or power circuits. The fuse must be able to open the circuit without arcing or serious flashing when crossed with any ordinary commercial light or power circuit.
   A heat coil which will operate before a sneak current can damage the instrument the protector is guarding.

The heat coil is designed to warm up and melt out with a current large enough to endanger the instruments if continued for a long time, but so small that it would not blow the fuses ordinarily found necessary for such instruments. These smaller currents are often called "sneak" currents.

3. The fuses must be so placed as to protect the arrester and heat coils, and the protector terminals must be plainly marked "line," "instrument," "ground."

g. Wires beyond the protector, except where bunched, must be neatly arranged and securely fastened in place in any convenient, workmanlike manner. They must not come nearer than six inches to any electric light or power wire in the building, unless incased in approved tubing so secured as to prevent its slipping out of place.

The wires would ordinarily be insulated, but the kind of insulation is not specified, as the protector is relied upon to stop all dangerous currents. Porcelain tubing or circular loom conduit may be used for incasing wires where required as above.

h. Wires connected with outside circuits, where bunched together within any building, or inside wires, where laid in conduits or ducts with electric light or power wires, must have fire-resisting coverings, or else must be inclosed in an air-tight tube or duct.

It is feared that if a burnable insulation were used, a chance spark might ignite it and cause a serious fire, for many installations contain a large amount of very readily burnable matter.

65. Electric Gas Lighting—

Where electric gas lighting is to be used on the same fixture with the electric light:

a. No part of the gas-piping or fixture shall be in electric connection with the gas-lighting circuit.

b. The wires used with the fixtures must have a non-inflammable insulation, or, where concealed between the pipe and shell of the fixture, the insulation must be such as required for fixture wiring for the electric light.

c. The whole installation must test free from "grounds."

d. The two installations must test perfectly free from connection with each other.

66. Insulation Resistance—

The wiring in any building must be test free from grounds; i. e., the complete installation must have an insulation between conductors and between all conductors and the ground (not including attachments, sockets, receptacles, etc.) of not less than the following:

Up to	5	amperes	4,000,000
“	10	“	2,000,000
“	25	“	800,000
“	50	“	400,000
“	100	“	200,000
“	200	“	100,000
“	400	“	25,000
“	800	“	25,000
“	1,600	“	12,500

All cutouts and safety devices in place in the above.

Where lamp sockets, receptacles and electroliers, etc., are connected, one-half of the above will be required.

67. Soldering Fluid—

a. The following formula for soldering fluid is suggested:

Saturated solution of zinc chloride	5 parts
Alcohol	4 parts
Glycerine	1 part

CLASS F.—MARINE WORK.

68. Generators—

a. Must be located in a dry place.

b. Must have their frames insulated from their bed-plates.

c. Must each be provided with a waterproof cover.

d. Must each be provided with a name-plate, giving the maker's name, the capacity in voltage and amperes and normal speed in revolutions per minute.

69. Wires—

a. Must have an *approved* insulating covering.

The insulation for all conductors, except for portables, to be approved, must be at least one-eighth-inch in thickness and be covered with a substantial waterproof and flameproof braid. The physical characteristics shall not be affected by any change in temperature up to 200 degrees Fahrenheit. After two weeks submersion in salt water at seventy degrees Fahrenheit it must show an insulation resistance of one megohm per mile after three minutes' electrification, with 550 volts.

b. Must have no single wire larger than No. 12 B. & S. Wires to be stranded when greater carrying capacity is required. No single solid wire smaller than No. 14 B. & S., except in fixture wiring, to be used.

Stranded wires must be soldered before being fastened under clamps or binding screws, and when they have a conductivity greater than No. 10 B. & S. copper wire they must be soldered into lugs.

c. Must be supported in approved molding, except at switchboards and portables.

Special permission may be given for deviation from this rule in dynamo rooms.

d. Must be bushed with hard-rubber tubing one-eighth of an inch in thickness when passing through beams and non-water-tight bulkheads.

e. Must have when passing through water-tight bulkheads and through all decks, a metallic stuffing tube lined with hard rubber. In case of deck tubes they shall be boxed near deck to prevent mechanical injury.

f. Splices or taps in conductors must be avoided as far as possible. Where it is necessary to make them they must be so spliced or joined as to be both mechanically and electrically secure without solder. They must then be soldered, to insure preservation, covered with an insulating compound equal to the insulation of the wire, and further protected by a waterproof tape. The joint must then be coated or painted with a waterproof compound.

70. Portable Conductors—

a. Must be made of two stranded conductors, each having a carrying capacity equivalent to not less than No. 14 B. & S. wire, and each covered with an approved insulation and covering.

Where not exposed to moisture or severe mechanical injury, each stranded conductor must have a solid insulation at least one-thirty-second of an inch in thickness, and must show an insulation resistance between conductors, and between either conductor and the ground, of at least one megohm per mile after one week's submersion in water at seventy degrees Fahrenheit and after three minutes' electrification, with 500 volts, and be protected by a slow-burning, tough-braided outer covering.

Where exposed to moisture and mechanical injury—as for use on decks, holds and fire-rooms—each stranded conductor shall have a solid insulation, to be approved, of at least one-thirty-second of an inch in thickness and protected by a tough braid. The two conductors shall then be stranded together, using a jute filling. The whole shall then be covered with a layer of flax, either woven or braided, at least one thirty-second of an inch in thickness, and treated with a non-inflammable, waterproof compound. After one week's submersion in water at seventy degrees Fahrenheit, at 550 volts and a three minutes' electrification, must show an insulation between the two conductors, or between either conductor and the ground, of one megohm per mile.

71. Bell or Other Wires—

a. Shall never be run in same duct with lighting or power wires.

72. Table of Capacity of Wires—

B. & S. G.	Area Actual C. M.	No. of Strands.	Size of Strands B. & S. G.	Amperes.
19	1,288	..	..	..
18	1,624	..	..	3
17	2,048	..	..	..
16	2,583	..	..	6
15	3,257	..	..	..
14	4,107	..	..	12
12	6,530	..	..	17
..	9,016	7	19	21
..	11.368	7	18	25
..	14,336	7	17	30
..	18,081	7	16	35
..	22,799	7	15	40
..	30,856	19	18	50
..	38,912	19	17	50
..	49,077	19	16	70
..	60,088	37	18	85
..	75,776	37	17	100
..	99,064	61	18	120
..	124,928	61	17	145
..	157,563	61	16	170
..	198,677	61	15	200
..	250,527	61	14	235
..	296,387	91	15	270
..	373,737	91	14	320
..	413,639	127	15	340

73. Switchboards—

When greater conducting area than that of 12 B. & S. G. is required, the conductor shall be stranded in a series of 7, 19, 37, 61, 91 or 127 wires, as may be required; the strand consisting of one central wire, the remainder laid around it concentrically, each layer to be twisted in the opposite direction from the preceding.

a. Must be made of non-combustible, non-absorptive insulating material, such as marble or slate.

b. Must be kept free from moisture, and must be located so as to be accessible from all sides.

c. Must have a main switch, main cutout and ammeter for each generator.

Must also have a voltmeter and ground detector.

d. Must have a cutout and switch for each side of each circuit leading from board.

74. Resistance Boxes—

a. Must be made of non-combustible material.

b. Must be located on switchboard or away from combustible material. When not placed on switchboard they must be mounted on non-inflammable, non-absorptive insulating material.

c. Must be so constructed as to allow sufficient ventilation for the uses to which they are put.

75. Switches—

a. Must have non-combustible, non-absorptive insulating bases.

b. Must operate successfully at fifty per cent overload in amperes with twenty-five per cent excess voltage under the most severe conditions they are liable to meet with in practice, and must be plainly marked where it will always be visible, with the name of the maker and the current and voltage for which the switch is designed.

c. Must be double-pole when circuits which they control supply more than six sixteen-candle-power lamps or their equivalent.

d. When exposed to dampness they must be inclosed in a water-tight case.

76. Cutouts—

a. Must have non-combustible, non-absorptive insulating bases.

b. Must operate successfully, under the most severe conditions they are liable to meet with in practice, on short circuit with fuse rated at fifty per cent above, and with a voltage twenty-five per cent above the current and voltage they are designed for, and must be plainly marked where they will always be visible with the name of the maker and current and voltage for which the device is designed.

c. Must be placed at every point where a change is made in the size of the wire (unless the cutout in the larger wire will protect the smaller).

d. In places such as upper decks, holds, cargo spaces and fire-rooms a water-tight and fireproof cutout may be used, connecting directly to mains when such cutout supplies circuits requiring not more than 660 watts energy.

e. When placed anywhere except on switchboards and certain places, as cargo spaces, holds, fire-rooms, etc., where it is impossible to run from center of distribution, they shall be in a cabinet lined with fire-resisting material.

f. Except for motors, searchlights and diving lamps shall be so placed that no group of lamps, requiring a current of more than six amperes, shall ultimately be dependent upon one cutout.

A single-pole covered cutout may be placed in the moulding when same cotains conductor supplying circuits requiring not more than 220 watts energy.

77. Fixtures—

a. Shall be mounted on blocks made from well seasoned-lumber treated with two coats of white lead or shellac.

b. Where exposed to dampness, the lamp must be surrounded by a vaporproof globe.

c. Where exposed to mechanical injury the lamp must be surrounded by a globe protected by a stout wire guard.

d. Shall be wired with same grade of insulation as portable conductors which are not exposed to moisture or mechanical injury.

78. Sockets—

a. No portion of the lamp socket or lamp base exposed to contact with outside objects shall be allowed to come into electrical contact with either of the conductors.

79. Wooden Mouldings—

a. Must be made of well-seasoned lumber, and be treated inside and out with at least two coats of white lead or shellac.

b. Must be made of two pieces, a backing and a capping, so constructed as to thoroughly incase the wire and provide a one-half-inch tongue between the conductors, and a solid backing which, under grooves, shall not be less than three-eights of an inch in thickness.

c. Where moulding is run over rivets, beams, etc., a backing strip must first be put up and the moulding secured to this.

d. Capping must be secured by brass screws.

80. Motors—

a. Must be wired under the same precautions as with a current of same volume and potential for lighting. The motor and resistance box must be protected by a double-pole cutout and controlled by a double-pole switch, except in cases where one-quarter horse-power or less is used.

The leads or branch circuits should be designed to carry a current at least fifty per cent greater than that required by the rated capacity of the motor to provide for the inevitable overloading of the motor at times.

b. Must be thoroughly insulated. Where possible, should be set on base frames made from filled, hard, dry wood and raised above surroundings deck. On hoists and winches they shall be insulated from bed-plates by hard rubber, fiber or similar insulating material.

c. Shall be covered with a waterproof cover when not in use.

d. Must each be provided with a name-plate giving maker's name, the capacity in volts and amperes and the normal speed in revolutions per minute.

INDEX TO NATIONAL ELECTRIC CODE.

RULE AND SECTION.

Acid fumes........10 (*c*), 24 (*j*) & (*k*)
Arc lamps, Construction of........57
Arc lamps, Installation of........19
Arc lamps, On low-potential circuits........29
Armored Cable........48

Base frames, Generators and motors........1 (*c*), 8 (*a*)
Batteries, Storage or primary........10
Binding screws, not to bear strain........28 (*f*)
Bonds, rails and car houses........35 (*g*)
Boxing, where necessary........18 (*e*), 24 (*c*), 32 (*d*)
Breweries........24 (*i*) to (*k*)
Burglar alarms........64
Burrs and fins. Fixture work........26 (*b*)
Bushings, for wires........14 (*d*)
Bushings, Lamp sockets........28 (*e*)
Bus bars........2 (*b*), 3 (*e*)

Cabinets for cutouts........54
Cable, Armored........48
Care and attendance........6
Car houses........35
Carrying capacity table........16
Car wiring........34
Central stations........1 to 7
Circuit-breakers, Construction of........52
Circuit-breakers, Installation of........9, 17, 21 (*e*)
Compensator coils........30
Concealed wiring........24 (*a*) to (*f*) & (*q*) to (*s*)
Condensers........61 (*b*)
Conductors. (See Wires)........
Conduits, Installation of........25
Conduits, Lined metal........49 (*b*) to (*i*)
Conduits, To be marked........49 (*a*)
Conduits, Unlined metal........49 (*j*) & (*k*)
Conduit work........24 (*n*) to (*p*)
Constant-Current systems........18 to 20
Constant-potential systems, General Rules........21 to 23
Converters. (See Tranformers)........11, 33, 62
Cutout cabinets........54
Cutouts, Construction of........52
Cutouts, Installation of........17, 21
Cutouts, Marine work........76
Cutouts, To be double pole........17 (*a*)

Decorative series lamps........31
Distance between conductors, inside........18 (*d*), 24 (*h*), (*j*) & (*r*)
Distance between conductors, outside........12 (*b*)
Drip loops at service entrances........12 (*g*)
Dynamo rooms........1 to 7

Economy coils........30
Electric gas lighting........65
Electric heaters........23
Electro magnetic devices for switches........20 (*c*)
Equalizers. (See Resistance Boxes)........
Extra high-potential systems........38 & 39

Feeders, Railway........35 (*f*)
Fished wires........24 (*c*) & (*s*)

RULE AND SECTION.
Fittings and materials.......40 to 63
Fixtures 26
Fixtures, Marine work.......77
Fixture wire.......46
Fixture wiring.......24 (*u*) to (*w*)
Flexible cord, Construction of.......45
Flexible cord, Construction of, Heaters.......45 (*h*)
Flexible cord, Construction of, Pendants.......45 (*b*) to (*f*)
Flexible cord, Construction of, Portables.......45 (*g*)
Flexible cord, use of.......28
Flexible tubing.......24 (*s*)
Foreign currents, protection against.......64
Formula for soldering fluid.......67
Fuses, Construction of.......53
Fuses, Installation of.......21

Gas lighting, Electric.......65
General plan of rules, page....... 3
General suggestions, page....... 4
Generators 1
Generators, Marine work.......68
Grounded circuits.......36
Grounding for dynamo and motor frames.......1 (*a*), 8 (*a*)
Grounds, Testing for....... 7
Ground wire for lightning arresters.......5 (*c*), 64 (*d*)

Hanger-boards, Construction of.......56
Hanger-boards, When not used.......19 (*d*)
Heaters, Electric.......23
High, constant-potential systems.......30 to 37

Incandescent lamps as resistances.......29 (*b*)
Inside work.......14 to 39
Insulating joints, Construction of.......59
Insulating joints, When required.......26 (*a*)
Insulation of trolley wires.......12 (*k*)
Insulation resistance.......66
Interior conduits. (See Conduits).......
Joints, in conductors.......12 (*f*), 14 (*c*)
Joints, Insulating. (See Insulating Joints).......

Lamps, Arc. (See Arc Lamps).......
Lamps, Incandescent series.......20
Lightning arresters, Construction of.......63
Lightning arresters, Installation of....... 5
Lights from trolley circuits.......36
Low-potential systems.......24 to 31

Marine work.......68 to 80
Mechanical injury, Protection against.......18 (*e*), 24 (*e*), 32 (*d*)
Motors 8
Motors, Marine Work.......80
Moulding, Construction of.......50
Moulding, Marine work.......79
Moulding work.......24 (*l*) & (*m*)

Oily waste....... 6 (*b*)
Open wiring.......24 (*a*) to (*k*)
Outside work.......12 & 13

Portable conductors.......45 (*g*) & (*h*)
Portable conductors for marine work.......70
Protection devices signal circuits.......64 (*e*)
Power from trolley circuits.......36

Railway power plants....... 9
Reactive coils.......61 (*a*)
Resistance boxes, Construction of.......60
Resistance boxes, Installation of....... 4
Resistance boxes, Marine work.......74
Resistance for arc lamps, Low-potential.......29 (*b*)

Series lamps.......31 & 37
Service blocks.......12 (*b*)

RULE AND SECTION.

Sockets, Construction of....55
Sockets, Installation of....27
Sockets, Marine work....78
Soldering fluid formula....67
Spark arresters, Construction of....58
Spark arresters, When required....19 (*c*), 29 (*c*)
Storage battery rooms....10
Switchboards....3
Switchboards, Marine work....73
Switches, Construction of....51
Switches, Electro-magnetic....20 (*c*)
Switches, Installation of....17 & 22
Switches, Marine work....75
Switches, To be double pole....17 (*a*)
Switches, When may be single pole....8 (*c*), 22 (*c*)
Systems, Constant-current....18 to 20
Systems, Constant-potential....21 to 39
Systems, Extra high, constant-potential....38 & 39
Systems, High, constant-potential....32 to 37
Systems, Low, constant-potential....21 to 31

Telegraph, telephone and other signal circuits....64
Testing....7
Transformers in central stations....11
Transformers, Construction of....62
Transformers, Inside....33
Transformers, Outside....13

Wire, Concentric....47 (*a*)
Fire, Fixtures....46
Wire, Lined conduit....47 (*a*)
Wire, Insulation of....40 to 48
Wire, Netting required on arc lamps....19 (*c*), 29 (*c*)
Wire, Rubber covered....41
Wire, Unlined conduit....47 (*b*)
Wire, Weatherproof....44
Wires, Carrying capacity table....16
Wires, Carrying capacity table, Marine work....72
Wires, Central stations....2
Wires, Concealed work....24 (*q*) to (*s*)
Wires, Conduit work....24 (*n*) to (*p*)
Wires, Distance between, inside....18 (*d*), 24 (*h*), (*j*) & (*t*)
Wires, Distance between, outside....12 (*b*)
Wires, Extra high-potential....38 & 39
Wires, Fished....24 (*c*) & (*s*)
Wires, General rules, low-potential....24 (*a*) to (*f*)
Wires, Ground return....12 (*n*)
Wires, High-potential....32 to 37
Wires, Inside, constant-current....18
Wires, Inside, general rules....14
Wires, Underground....15
Wires, Marine work....68
Wires, Moulding work....24 (*l*) & (*m*)
Wires, Open work, damp places....24 (*i*) to (*k*)
Wires, Open work, dry places....24 (*g*) & (*h*)
Wires, Outside, overhead....12
Wires, Slow-burning, weatherproof....42
Wires, Slow-burning....43
Wires, Trolley....12 (*j*) to (*m*)
Wires, Weatherproof....44

Note—Results of recent test made under the specifications given in Class D for cutouts, switches, conduits, wires, circuit-breakers, fuses, etc., can be seen at inspection offices, and should be consulted in all cases where any doubt exists as to the ability of any particular device to successfully meet the requirements given. Copies of laboratory reports on all devices can be obtained by architects, building owners and contractors by addressing the Electrical Bureau of the National Board of Fire Underwriters at the Chicago office, No. 67 East 21st Street, to which address new devices, or devices on which tests are required, should be sent.

SUPPLEMENT TO THE NATIONAL ELECTRICAL CODE.

CONTAINING LIST OF ELECTRICAL FITTINGS THAT HAVE BEEN EXAMINED AND APPROVED BY THE UNDERWRITERS' NATIONAL ELECTRIC ASSOCIATION, FOR USE UNDER THE RULES AND REQUIREMENTS OF THE NATIONAL BOARD OF FIRE UNDERWRITERS, FOR THE INSTALLATION OF WIRING AND APPARATUS. (SUBJECT TO QUARTERLY REVISION.)

Care should be taken in all cases to see that the Name or Trade-Mark of the manufacturer is marked on the article purchased, and that it corresponds with the photograph and description given in the laboratory report, in all cases where reports have been published.

ARC LAMP HANGER-BOARDS—

Adams-Bagnall Electric Company, Cleveland, Ohio.
Edeburn-Ambos Electric Co., 14 Middle street, Cleveland, Ohio.
General Electric Company, Schenectady, N. Y.
Hope Electric Appliance Company, Providence, R. I.
"Kelsch" board, Chicago Edison Company, Chicago.
"McDonald glass," National Glass Co., Marion, Ind.
Pass & Seymour, Syracuse, N. Y.
"Pfluger," Standard Electric Company, 315 Canal street, Chicago.
"Reliable," Hercules Machine & Electric Mfg. Co., Chicago.
"S. K. C." board, K. & W. Company, Pittsfield, Mass.
Turner Brass Works, 109 N. Water street, Chicago.
"Universal," Boston Electric Light Company.
Western Electric Company, Chicago and New York.
W. E. Company "roller" board, Chicago and New York.

ASBESTOS—For boards, sheets and tubes, H. W. Johns Company, Boston, Mass.

BUSHINGS—

(a) Marking—Must have the name, initials or trade-mark of the manufacturer stamped in the ware.

(b) Construction—Must be made straight, and free from checks or rough projections, with ends smooth and rounded to facilitate the drawing in of the wire and prevent abrasion of its covering.

(c) Material and Test—Must be made of non-combustible insulating material which, when broken and submerged for 100 hours in pure water at 70 degrees Fahr., will not absorb over one-half per cent of its weight.

(d) Sizes—Must have walls and heads at least as thick and substantial as those specified in the following table which gives internal and external diameter measurements for standard sizes:

Diameter of Hole.	External Diameter.	Thickness of Wall.	External Diameter of Head.	Length of Head.
5-16 in.	9-16 in.	1-8 in.	13-16 in.	1-2 in.
3-8	11-16	5-32	15-16	1-2
1-2	13-16	5-32	1 3-16	1-2
5-8	15-16	5-32	1 5-16	1-2
3-4	1 3-16	7-32	1 11-16	5-8
1	1 7-16	7-32	1 15-16	5-8
1 1-4	1 13-16	9-32	2 5-16	5-8
1 1-2	2 3-16	11-32	2 11-16	3-4
1 3-4	2 9-16	13-32	3 1-16	3-4
2	2 15-16	15-32	3 7-16	3-4
2 1-4	3 5-16	17-32	3 13-16	1
2 1-2	3 11-16	19-32	4 3-16	1

An allowance of 1-64 inch for variation in manufacturing will be permitted, except in the thickness of the wall.

Bushings made in accordance with the above standard can be obtained from any manufacturer of porcelain goods. They are supplied to the trade through local jobbers. In ordering specify "National Electrical Code Standard."

CABLES, ARMORED (for use only under Rule 24) (S)—
Greenfield Flexible Armored Cable (single wires or twin conductors). Sprague Electric Company, New York, N. Y.

CANOPY INSULATOR—W. T. C. Macallen Company, 416 Atlantic avenue, Boston.

CIRCUIT-BREAKERS (most recent types)—
Cutter Electrical & Manufacturing Company, Nineteenth and Hamilton streets, Philadelphia, Pa.
General Electric Company, Schenectady, N. Y.
Ward Leonard Electric Company, Bronxville, N. Y.
Westinghouse Electric & Manufacturing Company, Pittsburg, Pa.

CLEATS (See Rule 24—h)—

CONDUITS (with lining of insulating material)
Safety Armorite Conduit Company, Rankin Station, Pa.
Clifton Manufacturing Company, 65 Franklin street, Boston.
Consolidated Insulated Tube Co., John Hancock Bldg., Boston.
Sprague Electric Company, New York, N. Y.

CONDUITS (unlined pipe for wires with one-thirty-second-inch extra braided outer covering)—
"Electroduct," Boston Electroduct Company, Beaver Falls, Pa.
Greenfield Flexible Steel Conduit, Sprague Electric Company, New York, N. Y.
"Loricated pipe," Safety Armorite Conduit Company, Rankin Station, Pa.

CONDUITS (flexible, for fished work, loop system, not for regular conduit systems)—
Circular Loom, American Circular Loom Company, Boston, Mass.
Greenfield flexible steel conduit, Sprague Electric Company, New York, N. Y.

CUTOUTS (not over 750 volts direct and 3,500 volts alternating)—
These fuses must not be located near easily ignitable material unless inclosed in a fireproofed cabinet.
Cartwright air-tight fuse, Chase-Shawmut Company, 93 Federal street, Boston, Mass.
D. & W. non-arcing fuse, D. & W. Fuse Company, Providence, R. I.
Magnetic blowout cutout, General Electric Co., Schenectady, N. Y.

Note.—The General Electric Company, the Stanley Electric Manufacturing Company and the Westinghouse Electric & Manufacturing Company, all builders of apparatus for these and for extra high voltages, make fuse blocks of various special types, such as the lignum-vitæ blocks with aluminum fuses, blocks having the fuse enclosed, more or less, in tubes, and various other devices designed to break the arc. These will in general be acceptable for use on switchboards in fireproofed rooms where the flashes and melted metal, which are produced by many of them when a fuse melts, can do no harm. They are not suitable for use in ordinary rooms, on account of the ever present chance of easily ignitable material being placed near them.

There are also various types of primary fuse blocks used out-of-doors with transformers. Most of these will open a short circuit, and while in some arcing may occur, the location is such that no damage except to the block itself is done, so that most of the usual types found would be acceptable.

CUTOUTS (low-potential, not over 230 volts)—

Links on non-combustible bases inclosed in fireproofed cabinets. Minimum break distance two and one-half inches. Minimum separation of terminals of opposite polarity, unless separated by ample partitions, two and one-half inches. Fuses to be held free of contact with any portion of the base.

Cartwright air-tight fuse, Chase-Shawmut Company, 93 Federal street, Boston, Mass.

D. & W. non-arcing fuse, D. & W. Fuse Company, Providence, R. I.

Edison plug type—porcelain plugs up to 30 amperes, only when inclosed in fireproofed cabinets—General Electric Company, Schenectady, N. Y.

Paiste Company, Philadelphia, Pa., bases for Edison plug type.

Not over 125 volts:

Links on non-combustible bases inclosed in fireproofed cabinets. Minimum break distance one and one-fourth inches. Minimum separation of terminals of opposite polarity, unless separated by ample partitions, one and one-fourth inches. Fuses to be held free of contact with any portion of the base.

Cartwright air-tight fuse, Chase-Shawmut Company, 93 Federal street, Boston, Mass.

D. & W. non-arcing fuse, D. & W. Fuse Company, Providence, R. I.

Edison plug type—porcelain plugs up to thirty amperes—General Electric Company, Schenectady, N. Y.

Paiste Company, Philadelphia, Pa., bases for Edison plug type.

FLEXIBLE CORDS (not over 300 volts)—

Following is a list of companies equipped to manufacture cords designed in accordance with the standards given in the Code. Every coil supplied in accordance with these standards from these factories will be distinguished by tags bearing the words "National Electrical Code Standard," the manufacturer's name or trade-mark, and the date of manufacture:

Alfred F. Moore, Philadelphia, Pa.
American Electrical Works, Providence, R. I.
Bishop Gutta Percha Company, New York.
Eastern Electric Cable Company, Boston, Mass.
General Electric Company, Schenectady, N. Y.
The Okonite Company, New York, N. Y.
American Steel & Wire Company, Washburn & Moen Department, Worcester, Mass.
John A. Roebling's Sons Company, Trenton, N. J.
Safety Insulated Wire & Cable Company, New York.

For Portables—

For portable lamps, motors, etc., a special cable having a tough covering designed to withstand wear is required. The above manufacturers can furnish such cable.

FUSE LINKS (To have hard-metal tips, stamped with fuse rating and maker's name, or trade-mark)—

Chase-Shawmut Company, Boston, Mass.
Chicago Fuse Wire & Manufacturing Company, 154 Lake street, Chicago, Ill.
General Electric Company, Schenectady, N. Y.

INSULATING JOINTS FOR FIXTURES—

"American," American Gas Fixture Works, 208 N. Broad street, Philadelphia, Pa.

"Duntley," W. O. Duntley, 902 Olive street, St. Louis, Mo.
"Flagg," Stanley G. Flagg & Company, Philadelphia, Pa.
"Macallen," W. T. C. Macallen Company, 416 Atlantic avenue, Boston, Mass.
"Willard," Chicago Gas & Electric Fixture Manufacturing Company, Chicago, Ill.

NOTE—White or red lead should never be used when installing joints. Some insulating compound, such as asphaltum, is preferable.

LIGHTNING ARRESTERS—

General Electric Company, Schenectady, N. Y. Catalogue numbers 3,400 to 3,410 inclusive, and 2,362, 2,810, 2,368 and 4,978.
Stanley Electric Manufacturing Company, Pittsfield, Mass.
Westinghouse Electric & Manufacturing Company, Pittsburg, Pa. Types A, C, K, R, M, L, T, I and J.

PROTECTORS (for battery circuits)—

American Bell Telephone Company, 125 Milk street, Boston, Mass.
Chas. A. Rolfe, Chicago, Ill.
"Cook," Sterling Electric Company, Chicago.
D. & W. Fuse Company, Providence, R. I.
Western Electric Company, Chicago and New York.

ROSETTES—

Fused (Not over 125 volts)—These rosettes must not be located where inflammable flyings or dust will accumulate on them, and
Fuseless (Not over 300 volts)—These must have sufficient base to keep the wires and terminals at least one-half inch from the surface to which the rosette is attached.
General Electric Company, Schenectady, N. Y.
Gilmore Electric & Manufacturing Company, North Easton, Mass.
"Hartford," Hart Manufacturing Company, Hartford, Conn.
"K. W.," Bryant Electric Company, Bridgeport, Conn.
Marshall-Sanders Company, Boston, Mass.
Paiste Company, Philadelphia, Pa.
Pass & Seymour, Syracuse, N. Y.
Perkins Electric Switch Manufacturing Company, Hartford, Conn.
Peru Electric Company, Peru, Ind.

SOCKETS AND RECEPTACLES FOR INCANDESCENT LAMPS—

The following companies can furnish sockets designed in accordance with the requirements of the code, which were made in consultation with the socket manufacturers, and are designed to produce what may be known as the "Standard" socket:

In ordering insist on sockets made according to the National Electrical Code.

Key and Keyless Sockets (Edison or T. H. Base, for voltages not exceeding 250 and lamps not exceeding fifty candle-power, marked 50 c. p., 250 v.)—

Bryant Electric Company, Bridgeport, Conn.
General Electric Company, Schenectady, N. Y.
Marshall-Sanders Company, Boston, Mass.
Perkins Electric Switch Mfg. Company, Hartford, Conn.
Pass & Seymour, Syracuse, N. Y., porcelain shell.

Waterproof (550 volts or less)—

Bryant Electric Company, Bridgeport, Conn.
Pass & Seymour, Syracuse, N. Y.
Porcelain socket, General Electric Company, Schenectady, N. Y.

SPARK ARRESTERS—

General Electric Company, Schenectady, N. Y.
Globe Light, Heat & Power Company, Lake street, Chicago, Ill.
"Howard or Royal," Howard Arc Lamp Company.
Hoyoss & Daly, 229 W. Lake street, Chicago, Ill.
Philadelphia Electric & Manufacturing Co., Philadelphia, Pa.
"Universal," Universal Spark Arrester Company, Bourse Building, Philadelphia, Pa.

Western Electric Company, Chicago and New York.

SWITCHES—

Knife Switches—The better grade of switches made by practically all manufacturers are generally acceptable.

Switches should be made to comply with the following specifications, except in those few cases where peculiar design allows the switch to fulfill the requirements of the general rule (No. 51) in some other way. In such cases the switch should generally be submitted for special examination before being used.

1. Base. Must be mounted on non-combustible, non-absorptive, insulating bases, such as slate or porcelain.

   Bases of over twenty-five square inches area must have at least four supporting screws. Hole for supporting screws must be so located or countersunk that there will be at least one-half inch space measured over the surface between the head of the screw or washer and the nearest live metal part, and in all cases when between parts of opposite polarity, must be countersunk.
2. Mounting. Pieces carrying the contact jaws and hinge clips must be secured to the base by at least two screws, or else made with square shoulder, or provided with dowel-pins, to prevent possible turnings, and the nuts or screw heads on the under side of the base must be countersunk not less than one-eighth inch and covered with a waterproof compound which will not melt below 150 degrees Fahrenheit.
3. Hinges. Hinges of knife switches must not be used to carry current, unless they are equipped with spring washers held by locknuts or pins, so arranged that a firm and secure connection will be maintained at all positions of the switch blades.
4. Metal. All switches must have ample metal for stiffness and to prevent rise in temperature of any part of over fifty degrees Fahrenheit at full load, the contacts being arranged so that a thoroughly good bearing at every point is obtained with contact surfaces advised for pure copper blades of about one square inch for each fifty amperes, the whole device to be mechanically well made throughout.
5. Cross Bars. All cross bars less than three inches in length must be made of insulating material. Bars of three inches and over, which are made of metal to insure greater mechanical strength, must be sufficiently separated from the jaws of the switch to prevent arcs following from the contacts to the bar on the opening of the switch under any circumstances. Metal bars should preferably be covered with insulating material.

   To prevent possible turning or twisting, the cross-bar must be secured to each blade by two screws, or the joints made with square shoulders or provided with dowel-pins.
6. Connections. Switches for currents of over twenty-five amperes must be equipped with lugs, firmly screwed or bolted to the switch, and into which the conducting wires shall be soldered. For the smaller sized switches simple screws can be employed, provided they are heavy enough to stand considerable hard usage.
7. Test. Must operate successfully at fifty per cent overload in amperes, with twenty-five per cent excess voltage under the most severe conditions they are liable to meet with in practice.
8. Marking. Must be plainly marked where it will be visible, when the switch is installed, with the name of the maker and the current and the voltage for which the switch is designed.
9. Spacings. The following table shows minimum break distances and separation of nearest metal parts of opposite polarity of plain knife switches for different voltages and different currents. The values given refer to the marked capacities of the switches, and include the safety factors required by Article 7, above. The values given are correct for switches to be used on direct-current systems, and can, therefore, be safely followed in devices designed for alternating currents.

125 Volts or Less.	Separation of nearest metal parts of opposite polarity. Inches.	Minimum break distance. Inches.
FOR SWITCH AND PANEL BOARDS:		
10 amperes or less	¾	½
11-25 amperes	1	¾
26-50 amperes	1¼	1
FOR INDIVIDUAL SWITCHES:		
10 amperes or less	1	¾
11-35 amperes	1¼	1
36-100 amperes	1½	1¼
101-300 amperes	2¼	2
301-1000 amperes	3	2¾
125 to 250 volts for all switches:		
10 amperes or less	1½	1¼
11-35 amperes	1¾	1½
36-100 amperes	2¼	2
101-300 amperes	2½	2¼
301-1000 amperes	3	2¾
250 to 600 for all switches:		
10 amperes or less	3½	3
10-35 amperes	4	3½
36-100 amperes	4½	4

Auxiliary breaks or equivalent are recommended for switches designed for over 300 volts, and less than 100 amperes, and will be required on switches designed for use in breaking currents over 100 amperes, at a pressure of more than 300 volts.

SNAP SWITCHES—

Flush, push button, door, fixture and other snap switches used on constant potential systems, must be constructed in accordance with the following specifications:

1. Must "make" and "break" with a quick snap, and not stop when motion has once been imparted by the button or handle.
2. All switches must have ample metal for stiffness and to prevent rise in temperature of any part of over 50 degrees Fahrenheit at full load, the contacts being arranged so that a thoroughly good bearing at every point is obtained. The whole device to be mechanically well made throughout.

NOTE.—In order to meet the above requirements on temperature rise without causing excessive friction and wear on current carrying parts, contact surfaces of from 0.1 to 0.15 square inch for each 10 amperes will be required, depending upon the metal used and the form of construction adopted.

3. Pieces carrying contact jaws must be secured to the base by at least two screws, or else made with a square shoulder, or provided with dowel-pins or otherwise arranged, to prevent possible turnings; and the nuts or screw heads on the under side of the base must be countersunk not less than one-eighth inch, and covered with a waterproof compound which will not melt below 150 degrees Fahrenheit.
4. Current carrying parts must be mounted on non-combustible, non-absorptive insulating bases, such as slate or porcelain, and the holes for supporting screws should be countersunk not less than one-eighth inch; and in no case must there be less than three sixty-fourths inch space between supporting screws and current carrying parts.
5. Any material used for insulating current-carrying parts must retain its insulating and mechanical strength when subject to continued use, and must not soften at a temperature of 212 degrees Fahrenheit.
6. Binding posts must be substantially made, and the screws must

be of such size that the threads will not strip when set up tight with a screw-driver.

7. Covers made of conducting material, except face plates for flush switches, must be lined on sides and top with insulating, tough and tenacious material at least one thirty-second inch in thickness, firmly secured so that it will not fall out with ordinary handling. Side lining should extend slightly beyond the lower edge of the cover.
8. The handle or button or any exposed parts must not be in electrical connection with the circuit.
9. Must be plainly marked where it may be readily seen after the device is installed, with the name or trade-mark of the maker and the current and voltage for which the switch is designed.

NOTE.—On flush switches these markings may be placed on the back of the face-plate or on the sub-plate. On other designs they must be placed on the *front* of the cap, cover or plate.

10. Must operate successfully at 50 per cent overload in amperes and 25 per cent excess voltage under the most severe conditions they are liable to meet with in practice.
11. When slowly turned "on and off" at the rate of about two or three times per minute must "make and break" the circuit 6000 times before failing, while carrying the rated current.

NOTE.—Switches which indicate, upon inspection, whether the current be "on" or "off" are recommended. Sub-bases which will separate the wires at least ½ inch from the surface wired over should be furnished for all snap switches used in exposed knob or cleat work.

Not over 250 volts.
Hart & Hegeman Manufacturing Company, Hartford, Conn.
"Hartford," Hart Manufacturing Company, Hartford, Conn.
Marshall-Sanders Company, Boston, Mass.
"Jenkins," H. J. Paiste Company, Philadelphia, Pa.
"New England," O. S. Platt Manufacturing Company, Bridgeport, Conn.
Perkins Electric Switch Manufacturing Company, Hartford, Conn.
Not over 125 volts.
Paiste, lined cover, Bryant Electric Company, Bridgeport, Conn.
Push and pull type, made by Bryant Electric Co., Bridgeport, Conn.
Flush Switches.
Not over 250 volts.
General Incandescent Arc Light Company, New York.
"Diamond H.," Hart Manufacturing Company, Hartford, Conn.
"Hart," Hart & Hegeman Manufacturing Co., Hartford, Conn.
Not over 125 volts.
Marshall-Sanders Company, Boston, Mass.
"Bergmann," General Incandescent Arc Light Company, 572 First avenue, New York, N. Y.
C. & S. single and double push-button, Cutter Electric & Manufacturing Company, Philadelphia, Pa.
Flint & Lomax, 1523 South street, Denver, Col.
General Electric Company, Schenectady, N. Y.
"Hart," Hart & Hegeman Manufacturing Company, Hartford, Conn.
"New England," O. S. Platt Manufacturing Co., Bridgeport, Conn.
"Newton," Newton Appliance Company, 120 Liberty street, New York, N. Y.
"N. Y.," M. B. Austin & Company, Chicago, Ill.
P—M. Double-pole push-button, Morrison Southern Electric Company, Maryland.
Perkins, Perkins Electric Switch Mfg. Co.,Hartford, Conn.
Door Switches (not over 125 volts)—
Edwards & Co., New York, N. Y.
"Newton," Newton Appliance Company, 120 Liberty street, New York, N. Y.
Series Arc—
"Senior" and "Junior," Boston Electric Light Co., Boston, Mass.

Fort Wayne, Fort Wayne Electric Company, Fort Wayne, Ind.
General Electric Company, Schenectady, N. Y.
"Pfluger," C. A. Pfluger, 315 S. Canal street, Chicago, Ill.
Western Electric Company, Chicago and New York.
"Cutter," George Cutter Manufacturing Company, Chicago, Ill.

WIRES—

Following is a list of companies which manufacture insulated wire designed in accordance with the standards given in the Code.

Every coil supplied in accordance with these standards from these factories will be distinguished by tags stating the maximum voltage for which it is designed, the words "National Electric Code Standard," the manufacturer's name, trade name of the wire, if desired, and the date of manufacture.

RUBBER COVERED.

American Electric Works, Providence, R. I.
American Steel & Wire Company, W. & M. Dept., Worcester, Mass.
Ansonia Electrical Company, Ansonia, Conn.
Bishop Gutta-Percha Company, New York, N. Y.
W. R. Brixey, New York, N. Y.
Canadian General Electric Company, Toronto, Ont.
Crescent Insulated Wire Company, Trenton, N. J.
Eastern Electric Cable Company, Boston, Mass.
General Electric Company, Schenectady, N. Y.
Hazard Manufacturing Company, Wilkesbarre, Pa.
India Rubber & Gutta-Percha Insulating Company, Yonkers, N. Y.
Indiana Rubber & Insulated Wire Company, Jonesboro, Ind.
Alfred F. Moore, Philadelphia, Pa.
National India Rubber Company, Bristol, R. I.
New York Insulated Wire Company, New York, N. Y.
Okonite Company, Limited, New York, N. Y.
Phillips Insulated Wire Company, Pawtucket, R. I.
John A. Roebling's Sons Company, Trenton, N. J.
Safety Insulated Wire & Cable Company, New York, N. Y.
Simplex Electric Company, Boston, Mass.
Standard Underground Cable Company, Pittsburgh, Pa.

SLOW-BURNING WEATHERPROOF AND SLOW-BURNING.

American Electrical Works, Providence, R. I.
American Steel & Wire Company, Pawtucket, R. I.
Ansonia Electrical Company, Ansonia, Conn.
Collyer Insulated Wire Company, Pawtucket, R. I.
General Electric Company, Schenectady, N. Y.
Alfred F. Moore, Philadelphia, Pa.
Phillips Insulated Wire Company, Pawtucket, R. I.
John A. Roebling's Sons Company, Trenton, N. J.
Western Electric Company, Chicago and New York.

Weatherproof Line Wire.

American Electrical Works, Providence, R. I.
American Steel & Wire Company, W. & M. Dept., Worcester, Mass.
Ansonia Electrical Company, Ansonia, Conn.
Collyer Insulated Wire Company, Pawtucket, R. I.
General Electric Company, Schenectady, N. Y.
"K. K.," Holmes, Booth & Haydens, Waterbury, Conn.
Alfred F. Moore, Philadelphia, Pa.
Phillips Insulated Wire Company, Pawtucket, R. I.
John A. Roebling's Sons Company, Pawtucket, R. I.
Simplex Electrical Company, Boston, Mass.
Standard Underground Cable Company, Pittsburg, Pa.
Western Electric Company, Chicago and New York.

Conduit Wires. (See list of manufacturers of rubber-covered wires.)

MATERIALS—

The following are given as a list of Non-Combustible, Non-Absorptive Insulating Materials, and are listed here for the benefit of those who might consider hard rubber, fiber, wood and the like as fulfilling the above requirements. Any other substance, which it is claimed should be accepted, must be forwarded for testing before being put on the market.

1. Glass.
2. Marble (filled).
3. Slate without metal veins.
4. Porcelain, thoroughly glazed and vitrified.
5. Pure sheet mica.
6. Lava (certain kinds of).
7. Alberene stone.

CONDITIONS AND RESTRICTIONS OF FIRE INSURANCE POLICIES.

STANDARD FIRE INSURANCE POLICY FORMS OF THE STATES OF NEW YORK AND MASSACHUSETTS.

One of the best results of insurance legislation has been the enactment of laws in thirteen States requiring fire insurance companies legally doing business therein to use a prescribed form of policy in them. These have been of great service to propertyowners, both in protecting them from the difficulties almost certain to arise when there are as many different policy forms as there are companies, and in the convenience of being enabled, by the reading of one policy, to know the conditions governing all their insurance, so far as the policy itself is concerned. These remarks apply to the regularly licensed companies operating in any of the States requiring a specified form to be used; companies doing business in a State without authority will naturally use such policy forms as best suit their purposes. As a general rule it is advisable for the residents of a State requiring a standard policy form to carefully inspect policies of companies not authorized to do business in the State. Some disreputable companies have been known to smuggle into their policies a clause, the effect of which is often to materially reduce the amount of the insurance, if not to render the policy entirely void. There are various other clauses by means of which loss may be caused to the insured, hence special care should be exercised when offered the policies of unlicensed companies.

The States in which the use of a prescribed form of policy is compulsory are Connecticut, Louisiana, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Rhode Island, South Dakota and Wisconsin. Legislatures of other States have attempted to authorize the State Insurance Commissioner to prescribe a form for general use, but this delegation of their authority has been held to be unconstitutional.

There are two forms of policy, those adopted respectively by Massachusetts and New York, which have served as models for those of the other States. These two forms are here printed entire, and the deviations from them in the various other States are subsequently described. The index following the forms will enable any desired portion of either form to be quickly located.

The New York form for use by Mutual Companies begins:

In consideration of the stipulations herein named and of ...., does insure ....

An inscription on the policy warns the holder that:

It is important that the written portions of all policies covering the same property read exactly alike. If they do not they should be made uniform at once.

Upon the reverse side of the New York Standard Policy the following forms are printed:

ASSIGNMENT OF INTEREST BY INSURED.

The interest of..as owner of property covered by this Policy is hereby assigned to................ subject to the consent of .... Insurance Company.

NOTE.—To secure mortgagees, if desired, the policy should be made payable on its ace to such mortgagee. as follows: Loss, if any, payable to John Doe, mortgagee.

CONSENT BY COMPANY TO ASSIGNMENT OF INTEREST.

The .... Insurance Company hereby consents that the interest of ....as owner of the property covered by this policy be assigned to ....

....

Dated, ...

RECEIPT FOR CANCELLATION.

$..............

New York, ..., 1...

Received from .... Insurance Company of .... dollars, return premium, in consideration of which this policy is hereby canceled and surrendered to this company.

....

Massachusetts Standard Policy.

The...Insurance Company

This company shall not be liable beyond the actual value of the insured property at the time any loss or damage happens.

In consideration of...dollars

to it paid by the insured, hereinafter named, the receipt whereof is hereby acknowledged, does insure...

....and.................legal representatives against loss or damage by fire,

to the amount of...dollars.

(Form)...

Bills of exchange, notes, accounts, evidences and securities of property of every kind, books, wearing apparel, plate, money, jewels, medals, patterns, models, scientific cabinets and collections, paintings, sculpture, and curiosities are not included in said insured property, unless specially mentioned.

Said property is insured for the term of.., beginning on the....................................day of.................................in the year.........................hundred and................................, at noon, and continuing until the............................day of............................, in the year...........................hundred and......................, at noon, against all loss or damage by FIRE originating from any cause except invasion, foreign enemies, civil commotions, riots, or any military or usurped power whatever; the amount of said loss or damage to be estimated according to the actual value of the insured property at the time when such loss or damage happens, but not to include loss or damage caused by explosions of any kind unless fire ensues, and then to include that caused by fire only.

This policy shall be VOID if any material fact or circumstance stated in writing has not been fairly represented by the insured,—or if the insured now has or shall hereafter make any other insurance on the said property without the assent in writing or in print of the company,—or if, without such assent, the said property shall be removed, except that, if such removal shall be necessary for the preservation of the property from fire, this policy shall be valid without such assent for five days thereafter,—or if, without such assent, the situation or circumstances affecting the risk shall, by or with the knowledge, advice, agency, or consent of the insured, be so altered as to cause an increase of such risks, or if, without such assent, the said property shall be sold, or this policy assigned, or if the premises hereby insured shall become vacant by the removal of the owner or occupant, and so remain vacant for more than thirty days without such assent, or if it be a manufacturing establishment, running in whole or in part extra time, except that such establishments may run in whole or in part extra hours not later than nine o'clock P. M., or if such establishments shall cease operation for more than thirty days without permission in writing indorsed hereon, or if the insured shall make any attempt to defraud the company either before or after the loss,—or if gunpowder or other articles subject to legal restrictions shall be kept in quantities or manner different from those allowed or prescribed by law,—or if camphene, benzine, naphtha, or other chemical oils or burning-fluids shall be kept or used by the insured on the premises insured, except that what is known as refined petroleum, kerosene, or coal oil, may be used for lighting, and in dwelling-houses kerosene-oil stoves may be used for domestic purposes—to be filled when cold, by daylight, and with oil of lawful fire-test only.

If the insured property shall be exposed to loss by fire, the insured shall make all reasonable exertions to save and protect the same.

In case of any loss or damage under this policy, a STATEMENT in writing, signed and sworn to by the insured, shall be forthwith rendered to the company setting forth the value of the property insured, the interest of the insured therein, all other insurance thereon, in detail, the purposes for which and the persons by whom the building insured, or containing the property insured, was used, and the time at which and manner in which the fire originated, so far as known to the insured. The company may also examine the books of account and vouchers of the insured, and make extracts from the same.

In case of any loss or damage, the company, within sixty days after the insured shall have submitted a statement, as provided in the preceding clause, shall either pay the amount for which it shall be liable, *which amount if not agreed upon shall be ascertained by award of referees as hereinafter provided*, or replace the property with other of the same kind and goodness,—or it may, within fifteen days after such statement is submitted, notify the insured of its intention to rebuild or repair the premises, or any portion thereof separately insured by this policy, and shall thereupon enter upon said premises and proceed to rebuild or repair the same with reasonable expedition. It is moreover understood that there can be no abandonment of the property insured to the company, and that the company shall not in any case be liable for more than the sum insured, with interest thereon from the time when the loss shall become payable, as above provided.

If there shall be any OTHER INSURANCE on the property insured, whether prior or subsequent, the insured shall recover on this policy no greater proportion of the loss sustained than the sum hereby insured bears to the whole amount insured thereon. And whenever the company shall pay any loss, the insured shall assign to it, to the extent of the amount so paid, all rights to recover satisfaction for the loss or damage from any person, town, or other corporation, excepting other insurers; or the insured, if requested, shall prosecute therefor at the charge and for the account of the company.

If this policy shall be made payable to a mortgagee of the insured real estate, no act or default of any person other than such mortgagee or his agents, or those claiming under him, shall affect such mortgagee's right to recover in case of loss on such real estate: *provided*, that the mortgagee shall, on demand, pay according to the established scale of rates for any increase of risks not paid for by the insured; and whenever this company shall be liable to a mortgagee for any sum for loss under this policy, for which no liability exists as to the mortgagor, or owner, and this company shall elect by himself, or with others, to pay the mortgagee the full amount secured by such mortgage, then the mortgagee shall assign and transfer to the companies interested, upon such payment, the said mortgage, together with the note and debt thereby secured.

This policy may be CANCELLED at any time at the request of the insured, who shall thereupon be entitled to a return of the portion of the above premium remaining, after deducting the customary monthly short rates for the time this policy shall have been in force. The company also reserves the right, after giving written notice to the insured, and to any mortgagee to whom this policy is made payable, and tendering to the insured a ratable proportion of the premium, to cancel this policy as to all risks subsequent to the expiration of ten days from such notice, and no mortgagee shall then have the right to recover as to such risks.

In case of loss under this policy and a failure of the parties to agree as to the amount of loss it is mutually agreed that the amount of such loss shall be referred to three disinterested men, the company and the insured each choosing one out of three persons to be named by the other, and the third being selected by the two so chosen; the award in writing by a majority of the referees shall be conclusive and final upon the parties as to the amount of loss or damage, and such reference unless waived by the parties *shall be a condition precedent to any right of action in law or equity to recover for such loss*; but no person shall be chosen or act as a referee, against the objection of either party, who has acted in a like capacity within four months.

No suit or action against this company for the recovery of any claim by virtue of this policy shall be sustained in any court of law or equity in this commonwealth unless commenced within two years from the time the loss occurred.

IN WITNESS WHEREOF the said...Company has caused this policy to be signed by its President and attested by its Secretary (or such proper officers as may be designated), at their office in..................................; but this policy shall not be valid until countersigned by the duly authorized Agent of the Company at..................................

Dated......................................this......................day of.........................in the year of our Lord one thousand eight hundred and ninety........................and issued there.

Mas

. . . . .

ond t

. . . . .

ged,

. . . . .

. . . . .

. . . . .

every
nenti

. . . . .

. . . . .

ene
or

Standard Fire Insurance Policy of the State of New York.

IN CONSIDERATION of the Stipulations herein named and of .... Dollars Premium

Does Insure.. for the term of..............................

from the.............................. day of.............................. 18, ... at noon, to the.............................. day of.............................. 18......, at noon,

against all direct loss or damage by fire, except as hereinafter provided,

To an amount not exceeding.. Dollars.

to the following described property while located and contained as described herein, and not elsewhere, to wit:

form..

This company shall not be liable beyond the actual cash value of the property at the time any loss or damage occurs, and the loss or damage shall be ascertained or estimated according to such actual cash value, with proper deduction for depreciation however caused, and shall in no event exceed what it would then cost the insured to repair or replace the same with material of like kind and quality; said ascertainment or estimate shall be made by the insured and this company, or, if they differ, then by appraisers, as hereinafter provided; and, the amount of loss or damage having been thus determined, the sum for which this company is liable pursuant to this policy shall be payable sixty days after due notice, ascertainment, estimate, and satisfactory proof of the loss have been received by this company in accordance with the terms of this policy. It shall be optional, however, with this company to take all, or any part, of the articles at such ascertained or appraised value, and also to repair, rebuild, or replace the property lost or damaged with other of like kind and quality within a reasonable time on giving notice, within thirty days after the receipt of the proof herein required, of its intention so to do; but there can be no abandonment to this company of the property described.

This entire policy shall be void if the insured has concealed or misrepresented, in writing or otherwise, any material fact or circumstance concerning this insurance or the subject thereof; or if the interest of the insured in the property be not truly stated herein; or in case of any fraud or false swearing by the insured touching any matter relating to this insurance or the subject thereof, whether before or after a loss.

This entire policy, unless otherwise provided by agreement indorsed hereon or added hereto, shall be void if the insured now has or shall hereafter make or procure any other contract of insurance, whether valid or not, on property covered in whole or in part by this policy; or if the subject of insurance be a manufacturing establishment and it be operated in whole or in part at night later than ten o'clock, or if it cease to be operated for more than ten consecutive days; or if the hazard be increased by any means within the control or knowledge of the insured; or if mechanics be employed in building altering, or repairing the within described premises for more than fifteen days at any one time; or if the interest of the insured be other than unconditional and sole ownership; or if the subject of insurance be a building on ground now owned by the insured in fee-simple; or if the subject of insurance be personal property and be or become incumbered by a chattel mortgage; or if, with the knowledge of the insured, foreclosure proceedings be commenced or notice given of sale of any property covered by this policy by virtue of any mortgage or trust deed; or if any change, other than by the death of an insured, take place in the interest, title, or possession of the subject of insurance (except change of occupants without increase of hazard) whether by legal process or judgment or by voluntary act of the insured, or otherwise; or if this policy be assigned before a loss; or if illuminating gas or vapor be generated in the described building (or adjacent thereto) for use therein; or if (any usage or custom of trade or manufacture to the contrary notwithstanding) there be kept, used, or allowed on the above described premises, benzine, benzole, dynamite, ether, fireworks, gasolene, greek fire, gunpowder exceeding twenty-five pounds in quantity, naphtha, nitro-glycerine or other explosives, phosphorus, or petroleum or any of its products of greater inflammability than kerosene oil of the United States standard, (which last may be used for lights and kept for sale according to law but in quantities not exceeding five barrels, provided it be drawn and lamps filled by daylight or at a distance not less than ten feet from artificial light); or if a building herein described, whether intended for occupancy by owner or tenant, be or become vacant or unoccupied and so remain for ten days.

This company shall not be liable for loss caused directly or indirectly by invasion, insurrection, riot, civil war or commotion, or military or usurped power, or by order of any civil authority; or by theft; or by neglect of the insured to use all reasonable means to save and preserve the property at and after a fire or when the property is endangered by fire in neighboring premises; or (unless fire ensues, and, in that event, for the damage by fire only) by explosion of any kind, or lightning; but liability for direct damage by lightning may be assumed by specific agreement hereon.

If a buildng or any part thereof fall, except as the result of fire, all insurance by this policy on such building or its contents shall immediately cease.

This company shall not be liable for loss to accounts, bills, currency, deeds, evidences of debt, money, notes, or securities, nor, unless liability is specifically assumed hereon, for loss to awnings, bullion, casts, curiosities, drawings, dies, implements, jewels, manuscripts, medals, models, patterns, pictures, scientific apparatus, signs, store or office furniture or fixtures, sculpture, tools, or proprety held on storage or for repairs, nor, beyond the actual value destroyed by fire, for loss occasioned by ordinance or law regulating construction or repair of buildings, or by interruption of business, manufacturing processes, or otherwise; nor for any greater proportion of the value of plate glass, frescoes, and decorations than that which this policy shall bear to the whole insurance on the building described.

If an application, survey, plan, or description of property be referred to in this policy it shall be a part of this contract and a warranty by the insured.

In any matter relating to this insurance no person, unless duly authorized in writing, shall be deemed the agent of this company.

This policy may by a renewal be continued under the original stipulations, in consideration of premium for the renewed term, provided that any increase of hazard must be made known to this company at the time of renewal or this policy shall be void.

This policy shall be canceled at any time at the request of the insured; or by the company by giving five days notice of such cancelation. If this policy shall be canceled as hereinbefore provided, or become void or cease, the premium having been actually paid, the unearned portion shall be returned on surrender of this policy or last renewal, this company retaining the customary short rate; except that when this policy is canceled by this company by giving notice it shall retain only the *pro rata* premium.

If, with the consent of this company, an interest under this policy shall exist in favor of a mortgagee or of any person or corporation having an interest in the subject of insurance other than the interest of the insured as described herein, the conditions hereinbefore contained shall apply in the manner expressed in such provisions and conditions of insurance relating to such interest as shall be written upon, attached, or appended hereto.

If property covered by this policy is so endangered by fire as to require removal to a place of safety, and is so removed, that part of this policy in excess of its proportion of any loss and of the value of property remaining in the original location, shall, for the ensuing five days only, cover the property so removed in the new location; if removed to more than one location, such excess of this policy shall cover therein for such five days in the proportion that the value in any one such new location bears to the value in all such new locations; but this company shall not, in any case of removal, whether to one or more locations, be liable beyond the proportion that the amount hereby insured shall bear to the total insurance on the whole property at the time of fire, whether the same cover in new location or not.

If fire occur the insured shall give immediate notice of any loss thereby in writing to this company, protect the property from further damage, forthwith separate the damaged and undamaged personal property, put it in the best possible order, make a complete inventory of the same, stating the quantity and cost of each article and the amount claimed thereon; and, within sixty days after the fire, unless such time is extended in writing by this company, shall render a statement to this company, signed and sworn to by said insured, stating the knowledge and belief of the insured as to the time and origin of the fire; the interest of the insured and of all others in the property; the cash value of each item thereof and the amount of loss thereon; all incumbrances thereon; all other insurance, whether valid or not, covering any of said property; and a copy of all the descriptions and schedules in all policies; any changes in the title, use, occupation, location, possession, or exposures of said property since the issuing of this policy; by whom and for what purpose any building herein described and the several parts thereof were occupied at the time of fire; and shall furnish, if required, verified plans and specifications of any building, fixtures, or machinery destroyed or damaged; and shall also, if required, furnish a certificate of the magistrate or notary public (not interested in the claim as a creditor or otherwise, nor related to the insured) living nearest the place of fire, stating that he has examined the circumstances and believes the insured has honestly sustained loss to the amount that such magistrate or notary public shall certify.

The insured, as often as required, shall exhibit to any person designated by this company all that remains of any property herein described, and submit to examinations under oath by any person named by this company, and subscribe the same; and, as often as required, shall produce for examination all books of account, bills, invoices, and other vouchers, or certified copies thereof if originals be lost, at such reasonable place as may be designated by this company or its representative, and shall permit extracts and copies thereof to be made.

In the event of disagreement as to the amount of loss the same shall, as above provided, be ascertained by two competent and disinterested appraisers, the insured and this company each selecting one, and the two so chosen shall first select a competent and disinterested umpire; the appraisers together shall then estimate and appraise the loss, stating separately sound value and damage, and, failing to agree, shall submit their differences to the umpire; and the award in writing of any two shall determine the amount of such loss; the parties thereto shall pay the appraiser respectively selected by them and shall bear equally the expenses of the appraisal and umpire.

This company shall not be held to have waived any provision or condition of this policy or any forfeiture thereof by any requirement, act, or proceeding on its part relating to the appraisal or to any examination herein provided for; and the loss shall not become payable until sixty days after the notice, ascertainment, estimate, and satisfactory proof of the loss herein required have been received by this company, including an award by appraisers when appraisal has been required.

This company shall not be liable under this policy for a greater proportion of any loss on the described property, or for loss by the expense of removal from premises endangered by fire, than the amount hereby insured shall bear to the whole insurance, whether valid or not, or by solvent or insolvent insurers, covering such property, and the extent of the application of the insurance under this policy or of the contribution to be made by this company in case of loss, may be provided for by agreement or condition written hereon or attached or appended hereto. Liability for re-insurance shall be as specifically agreed hereon,

If this company shall claim that the fire was caused by the act or neglect of any person or corporation, private or municipal, this company shall, on payment of the loss, be subrogated to the extent of such payment to all right of recovery by the insured for the loss resulting therefrom, and such right shall be assigned to this company by the insured on receiving such payment,

No suit or action on this policy, for the recovery of any claim, shall be sustainable in any court of law or equity until after full compliance by the insured with all the foregoing requirements, nor unless commenced within twelve months next after the fire.

Wherever in this policy the word "insured" occurs, it shall be held to include the legal representative of the insured, and wherever the word "loss" occurs, it shall be deemed the equivalent of "loss or damage."

If this policy be made by a mutual or other company having special regulations lawfully applicable to its organization, membership, policies or contracts of insurance, such regulations shall apply to and form a part of this policy as the same may be written or printed upon, attached, or appended hereto.

This policy is made and accepted subject to the foregoing stipulations and conditions, together with such other provisions, agreements, or conditions as may be indorsed hereon or added hereto, and no officer, agent, or other representative of this company shall have power to waive any provision or condition of this policy except such as by the terms of this policy may be the subject of agreement indorsed hereon or added hereto, and as to such provisions and conditions no officer, agent, or representative shall have such power or be deemed or held to have waived such provisions or conditions unless such waiver, if any, shall be written upon or attached hereto, nor shall any privilege or permission affecting the insurance under this policy exist or be claimed by the insured unless so written or attached.

IN WITNESS WHEREOF, this company has executed and attested these presents.............................. day of.............................. 18.......

STANDARD POLICIES OF OTHER STATES.

The Standard Policy Forms of New York and Massachusetts have formed the basis for Standard Policies in other States, the variations being generally slight and unimportant. They are, in brief, as follows:

BASED UPON NEW YORK FORM.

CONNECTICUT.—The policy may specifically insure against damage by lightning, whether fire ensues or not; riders may be attached to policy modifying its provisions; the policy of a mutual company must name the amount for which the assured may be liable.

IOWA.—The Iowa Standard Policy is very similar to that of New York, differing in minor points to comply with the Insurance Code adopted in 1897.

LOUISIANA.—Same as New York form.

MICHIGAN.—Breach of a policy condition existing at time of a fire, or as a primary or contributory cause thereof, is necessary to void policy.

NEW JERSEY.—Same as New York form.

NORTH CAROLINA.—Same as New York form.

NORTH DAKOTA.—Same as New York form.

RHODE ISLAND.—Same as New York form.

SOUTH DAKOTA.—Same as New York form. Mutual companies exempted from its use.

WISCONSIN.—Policy provides that "Except when otherwise provided by statute, this company shall not be liable beyond the actual cash value," etc. Definition of agent omitted, being covered by statute. Clause providing that no suit shall be brought until after full compliance with requirements, nor unless begun within twelve months, is omitted. In the clause fixing time of payment of a loss at "sixty days after due notice, ascertainment, estimate, and satisfactory proof," the words "ascertainment," "estimate," and "satisfactory" are omitted. To the clause providing for cancellation upon five days' notice, the following is added: "Unless during a time in which the hazard shall be increased solely by the act of God, and in such case, and during such time of such increase of hazard, the company shall not cancel this policy except upon sixty days' notice of such cancellation, without the consent of the assured." The time for filing a statement of loss may be extended by agreement with the company or any authorized agent or adjuster acting for the company in relation to such loss. It is provided that knowledge of any agent of a company shall be held to be knowledge of the company.

BASED UPON MASSACHUSETTS FORM.

MAINE.—Same in effect as Massachusetts form.

MINNESOTA.—Total losses upon buildings are excepted from property to be valued in case of loss, because of the valued policy law. Riders, and especially coinsurance clauses, are prohibited, except as follows: Descriptions of property insured, permits for use of electricity or gasoline, or for storage of extra hazardous materials, for repairs and improvements, for the operation or ceasing to operate, and for the maintenance of sprinkler equipments or other improvements; insuring against damage by lightning, whether fire ensues or not. Minnesota companies may print in policies any provision authorized or required by law; and other State companies may, with the approval of the Insurance Commissioner, print any provision required by its charter or by the laws of its own State or country, not contrary to Minnesota law.

NEW HAMPSHIRE.—Substantially same as Massachusetts form. Portions of New Hampshire law (specified below) are required to be printed on reverse of policy and are made part of the contract: Chapter 13, Laws of 1879; Chapter 172, General Laws; Chapter 73, Laws of 1885.

INDEX TO THE
STANDARD FIRE INSURANCE POLICIES
OF NEW YORK AND MASSACHUSETTS.

Subject.	Line N. Y. Form.	 Mass. Form.
Abandonment of property to company not permitted	5-6	32
Acceptance of policy is subject to its conditions	113-116	......
Account books and vouchers may be examined	83	28
Accounts not insured (exception in Massachusetts)	38	8-9
Acknowledged, receipt of premium...	......	4
Action, conditions precedent to.......	106-107	48
Action must begin within (N. Y., 12 months), (Mass., 2 years)...........	106-107	50-51
Actual value, company not liable for more than	1, 41	2, 13
Agent must hold written authority of company	47-48	......
Agent must sign policy to render it valid	118	53
Agent, conditions which may be waived by	113-116	......
Alterations (N. Y., extending beyond 15 days), (Mass., increasing risk)..	15-16	17-18
Amount of insurance granted.........	e, form	6
Amount of loss shall be determined, how	86-91	12-14, 46-49
Amount of loss, on disagreement as to.	2-3, 86-91	......
Amount of loss on each item to be stated	72	......
Apparatus, scientific, not insured unless specified	40	......
Apparel not insured unless specified..	......	8-9
Application is a warranty and part of contract	45-46	......
Application of policy after removal of property	60-66	16-17
Apportionment of loss in case of other insurance	96-101	34-35
Appraisal not a waiver of company's rights	92-93	......
Appraisement of loss.................	3, 86-91	46-48
Appraisers to agree, failure of........	89	......

SUBJECT.	Line	
	N. Y. Form.	Mass. Form.
Appraisers or Referees, how chosen..	86-91	46-49
Appraisers' or Referees' decision final and binding	......	47-48
Appraisers to be chosen in case of disagreement	3	46
Ascertained, how amount of loss shall be	1-4, 86-91	12-13, 46-49
Arbitrators, (see appraisers)..........	......	......
Articles contrary to law voids policy, keeping	26-27	21-22
Articles not insured unless specified..	38-44	8-9
Assent of company must be obtained, when	11-30, 35	15-24
Assignment of mortgage to company..	......	39-41
Assignment of policy voids, unless (N. Y., before a loss)...............	22	18
Assignment of right of recovery from third person	102-105	35-37
Assignment form, on back of policy...	......	......
Assured, name of (see Insured).......	b, form	4-5
Attempt to defraud company voids policy	7-10	21
Attest	117-118	52-53
Award of Appraisers or Referees in writing (Mass., final)..............	89, 95	30, 47-48
Awnings not insured unless specified.	39	......
Benzine, use or storage of (N. Y., prohibited), (Mass., voids policy)......	24	22-23
Benzole, use or storage of, prohibited.	24	......
Bills not insured	38	......
Bills of exchange not insured unless specified	......	8-9
Bills or copies must be produced......	83	......
Books of account may be examined...	83	28
Books not insured unless specified....	......	8-9
Building must not be vacant or unoccupied over 10 days..............	29-30	......
Building must not remain vacant over 30 days	......	18-20
Building laws not assumed, loss by reason of	41-42	......
Building plans and specifications to be produced	76-77	......
Building, fall of, terminates insurance.	36-37	......
Bullion not insured unless specified...	39	......
Burning fluids, use or storage of, voids policy unless.....................	......	22-23
Cabinets and collections not insured unless specified	......	8-9
Camphene, use or storage of, voids policy	......	22-23
Cancellation of policy (see mortgage clause)	51-55	42-45
Care of exposed or damaged property.	32-34	25
Cash value, liability limited to actual.	1	......
Cash value of each item to be stated..	72	......
Casts not insured unless specified.....	39	......
Ceases, insurance, on fall of building.	36-37	......
Ceasing operation beyond (N. Y., 10 days), (Mass., 30 days), unless......	14	20-21

Subject.	Line N. Y. Form.	 Mass. Form.
Certificate of magistrate or notary public	77-80	......
Change in interest, title or possession.	20-22	......
Change of occupants without increase in hazard	21	......
Changes affecting property insured...	20-22, 74-75	17-18
Chattel mortgage prohibited without consent	18	......
Chemical oils, use or storage of, voids policy unless	......	22-23
Circumstance, misrepresentation or concealment of material, voids policy	7-8	15
Civil authority, not liable for loss caused by	32	......
Civil war or commotions, not liable for loss caused by	31-32	12
Claim for loss to be presented within 60 days	69-72	......
Coal oil may be used for lighting, etc.	......	23
Combustibles, use or storage of, voids policy unless	22-30	22-23
Commencement of policy	e	10-11
Compliance with requirements must precede suit	106-107	48
Concealment of material fact voids policy	7-8	15
Conditions precedent to right of action.	106-107	48
Consent of company to assignment—on back of policy	......	......
Consent of company to mortgagee's interest	56-59	......
Consequential losses not insured.....	41-42	......
Consideration of the contract.........	a	3
Contribution with other insurance....	43, 96-100	34-35
Copies of books of account, vouchers, etc., may be examined	84-85	28
Copies of descriptions and schedules in all policies	73-74	......
Countersigning of policy by agent necessary	118	53
Curiosities not insured unless specified.	39	8-9
Currency not insured	38	......
Customs of trade or manufacture.....	23-28	......
Damage to be estimated, how.........	1, 2, 86-91	12-13, 46-49
Damaged and undamaged property to be separated	67-69	......
Date of policy	119	54
Date of commencement and expiration of policy	c	10-11
Daylight, oil to be drawn and lamps filled by	28	23-24
Death of insured does not void policy.	20	......
Decision of referees final and binding.	......	47-48
Decorations, liability for damage.....	43-44	......
Deeds not insured	38	......
Default of others does not affect mortgagee's rights	......	37-41
Defraud, attempt to, voids policy.....	7-10	21
Depreciation, deductions for...........	1-2	......
Descriptions and schedules in all policies	73-74	......

	Line	
SUBJECT.	N. Y. Form.	Mass. Form.
Description of property part of contract if	45	......
Description of property insured	form	form
Dies not insured unless specified	39	......
Differences to be submitted to appraisers or referees	3, 86-91	46-49
Direct loss or damage only insured against	d	......
Disagreement as to loss, procedure in event of	3, 86-91	46-49
Drawings not insured unless specified.	39	......
Duties of insured in case of loss	67-80	25-28
Dynamite, use or storage of, voids policy unless	25	......
Election of company to pay mortgagee.	......	39-41
Election to repair, rebuild or replace property	4-5	30-31
Estimates of loss or damage, how to be made	1-2, 86-91	12-13, 46-49
Ether, use or storage of, voids policy unless	25	......
Evidences of debt (N. Y.) or property (Mass.) not insured unless specified.	38	8-9
Examination of books of account, vouchers, etc	82-85	28
Examination of insured under oath	82	......
Expenses of appraisal and umpire	90-91	......
Expenses of removal, how borne	96-100	......
Expiration of policy, date of	c	11
Explosion of any kind, liability for damage by	34	13-14
Explosives, use or storage of, restricted or prohibited	22-28	21-23
Exposure, changes in, since issuance of policy	74-75	......
Exposed property to be protected during fire	......	25
Extension of time for making proof of loss	70	......
Extent of application of policy may be provided for	98-99	......
Extracts and copies of books, vouchers, etc., may be made	84-85	28
Failure to agree in case of loss	3, 86-91	46-49
Fall of building terminates insurance.	36-37	......
False swearing voids policy	9-10	......
Fee simple ownership of ground required	17-18	......
Fifteen days' time limit for mechanics.	15-16	......
Fifteen days, company may elect to rebuild or repair within	......	30-31
Fire damage only in case of explosion, company liable for	34	13-14
Fire caused by act or neglect of a person or corporation, subrogation when	102-105	35-36
Fire, procedure in case of	67-80	25-33
Fireworks, use or storage of voids policy unless	25	......
Five barrels of kerosene may be kept.	26-28	......

	Line	
SUBJECT.	N. Y. Form.	Mass. Form.
Five days, property removed for safety insured for	60-64	16-17
Five days' notice required for cancellation	51-52	......
Fixtures not insured unless specified.	40	......
Fixtures, plans and specifications of, may be required	76-77	......
Foreclosure proceedings void policy unless	18-20	......
Forfeiture of insurance, what causes..	7-30, 49-50	15-23
Foreign enemies, no liability for loss caused by	31	12
Fraud voids policy	9-10	21
Frescoes, limit of liability for	43-44	......
Furniture and fixtures not insured unless specified	40	......
Gas, generation of illuminating, voids policy unless	22-23	......
Gasolene, use or storage of voids policy unless	25	......
Generation of illuminating gas voids policy unless	22-23	......
Greek fire, use or storage of, voids policy unless	25	......
Gunpowder, except in prescribed quantities, etc., voids policy	25	21-22
Hazard, increase of	14-15, 21, 50	17-18, 38
Hour of commencement and termination of policy, noon	c	11
Idleness of manufacturing risk (N. Y., over 10 days), (Mass., over 30 days), voids policy unless	14	20-21
Illuminating gas voids policy unless, generation of	22-23	......
Immediate written notice of loss to be given	67	26
Implements not insured unless	39	......
Increase of hazard	14-15, 21, 50	17-18, 38
Incumbrance voids policy unless	18	......
Incumbrances to be stated	73	......
Indorsement necessary to change conditions	113	......
Insolvent insurers, effect of	98	......
Insured and company to estimate loss.	2	......
Insured, meaning of	108	......
Insured, name of	b	4-5
Insured to protect property in case of fire	67-68	25
Insured to prosecute at request of company	......	35-36
Insured's duties in case of loss	67-68	25-28
Insured's rights to be assigned to company	102-105	......
Insurrection, no liability for loss caused by	31	......
Intention of company to repair, replace or rebuild	4-5	30-31
Interest, change of	18-22, 74-75	......
Interest due from time loss is payable.	......	32-33

	Line	
SUBJECT.	N. Y. Form.	Mass. Form.
Interest of insured must be truly stated or policy void	8-9	15
Interest of insured (N. Y., and others) to be stated in case of loss	72	27
Interest of insured must be sold and unconditional ownership	16-17	......
Interest in favor of mortgagee	56-59	37-41
Interruption of business, loss by, not insured	42	......
Items specifically insured	form	form
Invasion, no liability for loss caused by	31	12
Inventory to be made in case of loss	69	......
Invoices to be produced for examination	83	......
Jewels not insured unless specified	40	8-9
Judgment, change of interest by, voids policy	20-22	......
Kerosene oil may be kept (N. Y., not over five barrels)	26-28	23
Kerosene stoves permitted under restrictions	......	23-24
Knowledge and belief as to origin of fire	71	27-28
Knowledge of insured of increased hazard	14-15	17-18
Lamps and stoves to be filled by daylight	28	23
Laws regulating construction of buildings, loss by	42	......
Leased ground, building on, not insured unless	17-18	......
Legal process, change of interest by, voids policy	21-22	......
Liability for plate glass, frescoes and decorations	43-44	......
Liability for reinsurance as specifically agreed	100-101	......
Liability for direct damage by lightning may be assumed	35	......
Liability on property removed during fire	60-66	16-17
Liability in case of explosion	34	13-14
Liability limited to actual (N. Y., cash) value	1	2, 12-13
Liability not to exceed cost of repairing or replacing	2	......
Lightning, not liable for direct damage by, unless	34-35	......
Limit of liability	1, 2, 34-35, 41-44, 64-66, 96-100	2, 12-13, 32-33
Limitation concerning suit or action	106-107	50-51
Location of property insured	form	form
Location, change in	74	......
Loss, amount of	3, 72	29-30, 46-48
Loss caused by effect of building laws	41-42	......
Loss caused by invasion, riot, etc	31-32	12
Loss caused by removal during fire	96-97	......
Loss or damage, how ascertained	1, 2, 86-91	12-14, 30, 46-49
Loss, disagreement as to	......	46-49
Loss, immediate notice of, to be given	67	26

	Line	
SUBJECT.	N. Y. Form.	Mass. Form.
Loss, procedure in case of	67-85	25-33
Loss not to exceed cost of repairing or replacing	2	......
Loss, meaning of	109	......
Loss, when payable	3, 93-95	29
Loss caused by act or neglect, subrogation for	102-105	......
Loss statement of	70-80	26-28
Loss caused by theft, no liability for.	32	......
Loss to accounts, bills, etc., not covered	38	......
Loss to awnings, bullion, etc., not covered unless	39-41	8-9
Loss or damage by fire, except	d	12
Machinery, plans and specifications of, may be required	76-77	......
Magistrate's or notary's certificate as to loss	77-80	......
Manufacturing after (N. Y., 10 P. M.), (Mass., 9 P. M.), voids unless	13-14	19-20
Manufacturing plant idle over (N. Y., 10 days), (Mass., 30 days), voids unless	14	19
Manuscripts not insured unless specified	40	......
Material facts, misrepresentation of, voids policy	7-8	15
Matters voiding policy	7-30, 50	15-23
Mechanic's work limited to 15 days	15-16	......
Medals not insured unless specified	40	8-9
Military or usurped power, loss caused by, not covered	32	12
Misrepresentation voids policy	7-10	15
Models not insured unless specified	40	8-9
Money not insured (Mass., unless specified)	38	8-9
Mortgage voids policy unless	18	......
Mortgage foreclosure or notice of sale, voids unless	18-20	......
Mortgage, in case of	......	37-41
Mortgagee's interest, how protected	56-59	37-41
Mortgagee to have ten days' notice of cancellation	......	43-45
Mortgagee to assign mortgage	......	39-41
Mutual or other company having special regulations	110-112	......
Name of insured	b	4-5
Naphtha, use or storage of, voids policy (N. Y., unless)	25	22-23
Necessary removal of property	60	16-17
Neglect of third party, when loss caused by	102-105	......
Neglect to save and preserve property voids insurance	32-34	......
New location of removed property, how policy covers	60-66	16-17
Night work (N. Y., after 10 P. M.), (Mass., after 9 P. M.), voids unless.	13-14	19-20
Nitro-glycerine, use or storage of, voids policy unless	25	......

	Line	
SUBJECT.	N. Y. Form.	Mass. Form.
Nine P. M., manufacturing after, voids policy unless	......	19-20
Non-liability of company	31-35, 38-44	8-9, 15-24
Non-waiver of conditions by company.	92-93	......
Notary public or magistrate's certificates	77-80	......
Note, debt and mortgage to be assigned	......	40-41
Notes not insured (Mass., unless)	38	8-9
Notice of cancellation (see mortgage clause)	51-55	43-45
Notice of intention to repair, replace or rebuild	5	30-31
Notice of loss to be given immediately, written	67	26
Notice of sale under mortgage or trust deed	19-20	......
Occupancy, change in	20-22	17-18
Occupant at time of fire to be stated..	75-76	27-28
Occupation, change in, to be stated...	74-75	......
Office furniture and fixtures not insured unless	40	......
Officers, how policy and conditions may be waived by	113-116	......
Oil of legal standard only permitted..	......	23-24
Optional with company to repair, replace or rebuild	4-5	30-32
Ordinance regulating construction, loss caused by	41-42	......
Origin of fire to be stated if known...	70-71	27-28
Other insurance	11-13, 73, 96-100	15-16, 27, 34-35
Ownership of ground must be in fee-simple unless	17-18	......
Ownership to be unconditional and sole unless	16-17	......
Paintings not insured unless	......	8-9
Patterns not insured unless	40	8-9
Payment of appraisers and umpire....	90-91	......
Payment of increased rate by mortgagee	......	37-38
Payment of loss due 60 days after proof	3-4, 93-95	29
Payment of unearned premium	53	42-43
Payment of premium acknowledged...	......	4
Personal property, encumbrance on, voids policy unless	18	......
Petroleum or its products (except kerosene oil) voids unless	26-27	......
Petroleum (refined) or kerosene oil may be kept for use	......	23
Phosphorus, use or storage of, voids policy unless	26	......
Pictures not insured unless	40	......
Plan of property part of contract if referred to	46	......
Plans and specifications may be required	76-77	......
Plate glass, liability for	43-44	......
Plate not insured unless	......	8-9
Policy must be countersigned	117-118	53
Possession, change in	20-22, 74	17-18
Power to waive conditions of policy..	113-116	......

	Line	
SUBJECT.	N. Y. Form.	Mass. Form.
Premium, amount of	a	3
Premium, acknowledgment of receipt of	......	4
Premium, unearned	53	42-43
Preserved during and after fire, property to be	32-34, 67-68	25
Proof of loss to be filed within 60 days.	69-80	......
Proof of loss, what must be shown by.	70-80, 93-95	26-28
Property endangered	60	25
Property held on storage or for repair.	41	......
Property insured	form	form
Property not insured	38	......
Property not insured unless	39-41	8-9
Proportionate liability when other insurance	60-66, 96-100	34-35
Pro-rata premium, when returned	54-55	43-44
Prosecution for the company	......	36
Prosecution of claim within (N. Y., 12 months), (Mass., 2 years)	106-107	50-51
Protection of property	33, 60, 67-68	25
Rebuilding, notice of (N. Y., 30 days), (Mass., 15 days)	5	30-31
Receipts of premium, acknowledgment of	......	4
Referee, who may act as	......	46-49
Referees, how chosen	......	46-49
Referees' decision final and binding	......	47-48
Regulations, special, of mutual and other companies	110-112	......
Reinsurance, liability for	100-101	......
Removal of property, how policy covers	60-66	16-17
Removal of owner or occupant	......	18-19
Renewal of policy	49-50	......
Repair or replace, cost to, the measure of damage	2	......
Repairing, notice of (N. Y., 30 days), (Mass., 15 days)	5	30-31
Repairing longer than 15 days voids policy unless	15-16	......
Repairs to damaged property must be prompt	......	31-32
Repairs or storage, property held for.	41	......
Replacing, notice of (N. Y., 30 days), (Mass., 15 days)	5	30-31
Return of unearned premium on cancellation	52-55	42-44
Right of action, conditions precedent to	106-107	48
Rights of parties under policy payable to mortgagee	56-59	37-41
Riot, no liability for loss caused by	31	12
Risk, increase of	14-15, 21, 50	17-18, 38
Sale of property (N. Y., under mortgage or trust deed) voids policy unless	18-20	18
Satisfactory proof of loss	4, 94	......
Salvage to be subject to examination.	81-82	......
Scientific apparatus not insured unless specified	40	......

Subject.	Line	
	N. Y. Form.	Mass. Form.
Scientific cabinets and collections not insured unless specified	......	8-9
Sculpture not insured unless specified.	40	8-9
Securities not insured (Mass., unless specified)	38	8-9
Separation of damaged and undamaged property	68	......
Short-rate premium, when retained by company	53-54	42-43
Signs not insured unless specified	40	......
Sixty days, statement to be made after fire, within	70-71	......
Sixty days, loss payable after statement submitted, within	......	29
Sole and unconditional ownership required unless	16-17	......
Solvent and insolvent insurers, contribution by	98	......
Sound value and damage to be stated by appraisers	88-89	......
Special agreements and conditions permitted	11, 35, 39, 98-100, 113-116	......
Special inclusion of excepted articles necessary	39-44	8-9
Special regulations of mutual or other company	110-112	......
Specifications and plans may be required	76-77	......
Statement to be made by insured in case of loss	70-76	26-28
Stoves, oil, may be used under restrictions	......	23
Storage, property held on, not insured unless specified	41	......
Store or office furniture not insured unless specified	40	......
Subject of insurance (see form)	13, 17, 18, 21, 57	7
Subrogation, concerning	102-105	35-36
Subrogation to mortgagee's interest..	......	39-41
Suit must be begun within (N. Y., 12 months), (Mass., 2 years)	106-107	50-51
Sum for which company is liable	3-4, 93-95	29
Sum insured plus interest, liability cannot exceed	......	32-33
Surrender of policy or renewal on cancellation	53	......
Survey becomes part of contract if referred to	45-46	......
Ten days' idleness of factory voids unless	14	......
Ten days' vacancy or unoccupancy voids unless	28-30	......
Ten days' notice required for cancellation	......	44-45
Ten o'clock P. M., manufacturing after, voids unless	13-14	......
Term of policy	b-c	10-11
Theft, no liability for loss by	32	......
Third persons, company subrogated to rights against	102-105	35-36

	Line	
SUBJECT.	N. Y. Form.	Mass. Form.
Thirty days' idleness without permission voids policy	......	20-21
Thirty days, notice of repairment within	5	......
Thirty days' vacancy without permission voids policy	......	19
Time of fire determines value of property	1, 65-66, 70-71, 75-76	2-13
Time of occurrence of fire to be stated if known	......	27-28
Time of commencement and expiration of policy, noon	c	11
Title, change in	21, 74	18
Tools not insured unless specified	41	......
Transfer of mortgage to company	......	39-41
True statement of interest is required.	8-9	15
Trust deed, sale by virtue of, voids unless	18-20	......
Twelve months, suit must be commenced within	106-107	......
Two years, suit must be commenced within	......	50-51
Umpire (see Referee), how chosen	87-91	......
Unconditional ownership required unless	16-17	......
Undamaged and damaged property to be separated	68	......
Unearned premium to be returned on cancellation	53	......
Unoccupancy longer than (N. Y., 10 days), (Mass., 30 days) voids policy, unless	28-30	19
Usage or custom of trade or manufacturer	23-24	......
Use and occupancy at time of fire to be stated	75-76	27
Use or occupation of property, change in	74-75	......
Usurped power, not liable for loss caused by	31-32	12
Vacancy longer than (N. Y., 10 days), (Mass., 30 days) voids policy unless.	28-30	19
Value of insured property to be stated in case of loss (N. Y., each item)	72	26
Vapor or gas, illuminating, generation of voids unless	22-23	......
Voids policy, what	7-30, 50	15-21
Voluntary act, change of interest by	22	......
Vouchers may be examined after a loss	83-85	28
Waiver of conditions, what constitutes.	113-116, 92-93	......
Waiver must be written upon or attached to policy	115	......
War, no liability for loss caused by	31-32	12
Warranty by the insured, application, plans, etc., constitute	45-46	......
Wearing apparel not insured unless specified	......	8-9
Where insurance covers (see form)	60-66	16-17

Subject.	Line N. Y. Form.	Line Mass. Form.
Written permission of company, when required	11-30, 39-44, 56-57	8-9, 16-21
Written authority necessary for agent.	47-48	......
Written award of appraisers or referees	89, 95	47-49
Written extension of time for filing statement of loss	70	......
Written misrepresentation voids policy	7	15
Written notice of cancellation required of company	......	43-45
Written notice of loss must be given immediately	67	......
Written statement of loss to be rendered	......	26

SPECIAL CLAUSES USED IN CONJUNCTION WITH FIRE INSURANCE POLICIES.

Below will be found copies of the principal clauses, permits and privileges used by insurance companies in the United States. Each clause, on being put into use, is dated and countersigned by an agent or official of the company issuing the policy to which it is attached, and it bears an inscription as follows: "Attached to and forming part of policy No.................................. Insurance Company."

Elsewhere is given a list of States which have enacted laws forbidding the using of coinsurance clauses.

FULL VALUE CO-INSURANCE CLAUSE.

If at the time of the fire the whole amount of insurance on the property covered by this policy shall be less than the actual cash value thereof, this company shall, in case of loss or damage, be liable for such portion only of the loss or damage as the amount insured by this policy shall bear to the actual cash value of such property.

This clause is sometimes modified so as to apply to one or more specific items of the policy.

N. Y. Standard,

PERCENTAGE CO-INSURANCE CLAUSE.

If at the time of fire the whole amount of insurance on the property covered by this policy shall be less than per cent of the actual cash value therof, this company shall, in case of loss or damage, be liable for only such portion of such loss or damage as the amount insured by this policy shall bear to the said per cent of the actual cash value of such property.

N. Y. Standard,

PERCENTAGE CO-INSURANCE CLAUSE (FOR APPLICATION TO SPECIFIC ITEMS OF POLICY).

If at the time of fire the whole amount of insurance on the property covered by the item of this policy on shall be less than per cent of the actual cash value thereof, this company shall, in case of loss or damage, be liable for only such portion of such loss or damage as the amount insured under said item shall bear to the said per cent of the actual cash value of the property covered by such item.

N. Y. Standard,

PERCENTAGE VALUE CLAUSE.

If at the time of fire the whole amount of insurance on the property covered by this policy shall exceed per cent of the actual cash value thereof, this company, in case of loss or damage shall not be liable to pay more than its pro rata share of said per cent of the actual cash value of such property; and should the whole insurance at the time of fire exceed the said per cent, a pro rata return of premium on such excess of insurance from the time of the fire to the expiration of this policy shall be made on surrender of the policy.

Also modified to apply wholly to certain specific items of the policy.

N. Y. Standard,

PERCENTAGE CO-INSURANCE AND LIMITATION CLAUSE.

If at the time of fire the whole amount of insurance on the property covered by this policy shall be less than per cent of the actual cash value thereof, this company shall, in case of loss or damage, be liable for such portion only of the loss or damage as the amount insured by this policy shall bear to the said per cent of the actual cash value of such property; provided, that in case the whole insurance shall exceed per cent of the actual cash value of the property covered by this policy, this company shall not be liable to pay more than its pro rata share of said per cent of the actual cash value of such property; and should the whole insurance at the time of fire exceed the said per cent a pro rata return of premium on such excess of insurance from the time of the fire to the expiration of this policy shall be made on surrender of the policy.

N. Y. Standard,

PERCENTAGE CO-INSURANCE AND LIMITATION CLAUSE (FOR APPLICATION TO SPECIFIC ITEMS OF POLICY).

If at the time of fire the whole amount of insurance on the property covered by the item of this policy on shall be less than per cent of the actual cash value thereof, this company shall in case of loss or damage be liable for only such portion of such loss or damage as the amount insured under said item shall bear to the said per cent of the actual cash value of property covered by such item; provided, that in case the whole insurance on the property covered by said item shall exceed per cent of the actual cash value of the same, this company shall not on said item be liable to pay more than its pro rata share of said per cent of the actual cash value of such property and should the whole insurance on said item at the time of fire exceed the said per cent a pro rata return of the premium on such excess of insurance from the time of the fire to the expiration of this policy shall be made on surrender of the policy.

DWELLING ABOVE GRADE FLOOR.

It is understood and agreed, that the above described building is occupied exclusively for dwelling purposes above the grade floor.

FOUR-FIFTHS CO-INSURANCE CLAUSE.

It is a part of the consideration of this policy and a basis upon which the rate of premium is fixed, that the assured shall maintain insurance on the property hereby insured by this policy to the extent of four-fifths of the actual cash value thereof, and that failing so to do the insured shall be a co-insurer to the extent of such deficit, and in that event shall bear his, her or their proportion of any loss.

It is, however, mutually understood and agreed, that in case the total insurance shall exceed four-fifths of the whole cash value of the property insured by this policy, the assured shall not recover from this company more than its pro rata share of four-fifths of the whole actual cash value of such property.

AVERAGE CLAUSE.—DISTRIBUTION FORM.

It is understood and agreed, that the amount insured by this policy shall attach in each of the above-named premises, in that proportion to the whole amount insured that the value of the property covered by this policy, contained in each of said places, shall bear to the value of such property contained in all of above-named premises.

AVERAGE CLAUSE.—CO-INSURANCE PLAN.

It is hereby agreed, in case of loss or damage under this policy, the assured shall recover of this company such proportion of said loss only as the amount hereby assured shall bear to the whole value of property at risk hereunder.

AVERAGE, OR CO-INSURANCE CLAUSE.

It is understood and agreed, that in case of loss under this policy, this company shall be liable only for such proportion of the whole loss as the amount of this insurance shall bear to the cash value of the whole property herein described at the time of the fire. Other insurance permitted without notice until required.

N. Y. Standard,

CO-INSURANCE CLAUSE FOR FLOATING POLICY.

It is hereby declared and agreed that in case the property aforesaid in all the buildings, places or limits included in this insurance shall, at the breaking out of any fire or fires, be collectively of greater value than the sum insured, then this company shall pay and make good such a portion only of the loss or damage as the sum insured shall bear to the whole value of the property aforesaid, at the time when such fire or fires shall first happen.

But it is at the same time declared and agreed, that if any specific parcel of goods included in the terms of this policy, or such goods in any specified building or buildings, place or places, within the limits of this insurance, shall at the time of any fire be insured in this or any other office, this policy shall not extend to cover the same, excepting only as far as relates to any excess of value beyond the amount of such specific insurance or insurances, and shall not be liable for any loss, unless the amount of such loss shall exceed the amount of such specific insurance or insurances, which said excess only is declared to be under the protection of this policy and subject to average, as aforesaid.

It being the true intent and meaning of this agreement that this company shall not be liable for any loss unless the amount of such loss shall exceed the amount of the specific insurance or insurances, and then only for such excess, which said excess shall be subject to average, as above.

TEXAS EQUITABLE CO-INSURANCE AND CONTRIBUTION CLAUSE.

It is understood and agreed that this company shall be liable only for such proportion of the loss under any division of this policy as the amount hereby insured on said division bears to the total value of the property described therein. Provided, that in the event the total insurance on any division of property, as per division of this policy, shall be equal to or exceed the total cash value thereof, then this company shall be liable only for its pro rata share of the loss under such division, it being understood and agreed that the term "total insurance" embraces the amount for which the assured becomes co-insurer as per agreement as follows, to-wit:

It is understood and agreed that the assured shall be a co-insurer for at least the following amounts, to-wit: If at the time of the fire the total value of all property covered by this policy shall amount to $25,000 or less, the assured shall be a co-insurer for at least 25 per cent of the value of each division of property as per division of this policy; if the total value of all property shall be more than $25,000 and does not exceed $50,000, the assured shall be a co-insurer for at least 20 per cent of the value of each division of property; if the total value of all property shall be more than $50,000 and does not exceed $100,000, the assured shall be a co-insurer for at least 15 per cent of the value of each division of property; if the total value of all property shall exceed $100,000, the insured shall be a co-insurer for at least 10 per cent of the value of each division of property.

Other insurance permitted without notice until required.

This slip is attached to and forms a part of Policy No. , of the Insurance Company. Agent.

COTTON FORM.—SPECIFIC POLICY.

$ on cotton in bales, owned or held by in trust or in commission, or sold but not delivered, while contained in the

And it is agreed and understood to be a condition of this insurance, that this policy shall not apply to or cover any cotton which may at the time of loss be covered in whole or in part by a marine policy; and it is further agreed to be a condition of this policy that only actual payment, by check or otherwise, for cotton purchased, shall constitute delivery of cotton from the seller to the buyer; and it is further agreed that tickets, checks or receipts delivered to bearer, shall not be considered as evidence of ownership; and it is further agreed that this company shall be liable for only such proportion of the whole loss as this insurance bears to the cash value of the whole property herein described at the time of fire.

Other insurance permitted without notice until required.

COTTON FORM.—COMMON CARRIER.

On their liability as common carriers, for cotton in bales, for which bills of lading have been issued by their duly authorized agents, while contained in

It is hereby understood and agreed that in case of loss under this policy, this company shall be liable only for such proportion of the whole loss as the amount of this insurance bears to the cash value of the whole property herein described, at the time of the fire.

It is also agreed that, if this company shall pay any sum for loss under this policy, it shall at once, and to the extent of such payment, be legally subrogated to all the rights of the party to whom such payment shall have been made.

Other insurance permitted without notice until required.

COTTON FORM.—WAREHOUSEMEN.

On their liability on cotton in bales, consigned to them by the common carrier for compressing or awaiting shipment, contained in the

It is understood and agreed that, in case of loss under this policy, this company shall be liable only for such proportion of the whole loss as the amount of this insurance bears to the cash value of the whole property herein described at the time of the fire. Any loss that may be ascertained and proven to be due the assured under this policy shall be held payable to the above-named common carrier as its liability may appear.

Other insurance permitted without notice until required.

TWO-THIRDS VACANCY CLAUSE.

In consideration of the following agreement, permit is hereby given for the premises described in this policy to remain vacant or unoccupied from the day of , 190 , to the day of

, 190 , at noon, and it is hereby agreed by this company and the assured, that this company shall not be liable for more than two-thirds of any loss occurring during said vacancy on the property insured by this policy, nor for more than two-thirds of the amount of said policy, or any item thereunder; nor in case of other insurance on said property for more than its pro rata proportion of two-thirds of such loss, whether such insurance has become void or not; and further, it is agreed that the building insured or containing the property insured, shall at all times during such vacancy be under the care and supervision of some competent person, the doors and windows securely locked, and all rubbish removed, or this policy shall be void.

VACANCY PERMIT.

Permission is hereby granted for the building described in this policy to be vacant or unoccupied for the period of days from this day of , 1900 .

And in consideration of the increased hazard by reason of such vacancy, it is hereby agreed that during such vacancy one-third of the amount of the insurance hereunder upon such building shall be and remain suspended and of no effect; and in case of loss this company shall not be liable to pay or make good to the assured exceeding two-thirds of the sum insured, nor exceeding two-thirds of the interest of the assured in the property, and provided that if there is other insurance upon the property then this company shall only be liable for two-thirds of such proportion of the loss or damage as the sum hereby insured bears to the whole amount of insurance thereon, whether such other insurance contains a similar provision or not.

In case of other insurance on property covered by this policy that has been or shall be rendered void or voidable by the vacancy or non-occupancy hereby permitted for the purpose of contribution in case of loss, such other insurance shall be held as valid and subsisting.

Warranted that the doors and windows of the building herein described shall be securely locked or fastened during the period for which this permit is granted, or this permit and the policy to which it belongs shall be void and of no effect.

THREE-QUARTERS LOSS CLAUSE.

It is understood and agreed to be a condition of this insurance that in case of any loss under this policy this company is to be liable only for three-fourths of said loss, not exceeding the sum insured, and the other one-fourth to be borne by the assured; and in the event of other insurance permitted thereon, then liable for its proportion only of such loss.

THREE-FOURTHS LOSS CLAUSE.

It is understood and agreed to be a condition of this insurance that in the event of loss under this policy this company shall not be liable for an amount greater than three-fourths of such loss (not exceeding the sum hereby insured), and in the event of additional insurance permitted hereon then this company shall not be liable for an amount greater than its proportion of three-fourths of such loss; in both events the other one-fourth to be borne by the assured.

Special reference being had to the assured's application, No. , on which this insurance is based, and which is hereby made a warranty by the assured and a part of this policy.

WISCONSIN.—THREE-FOURTHS CLAUSE.

It is a part of the consideration of this policy and the basis upon which the rate of premium is fixed that in the event of a loss this company shall not be liable for any amount greater than its proportion of three-fourths of the actual cash value of the property covered by this policy at the time of such loss; also that the insured shall maintain insurance on this property insured by this policy to the extent of three-fourths of the actual cash value thereof at the time of any fire; failing so to do the assured shall be an insurer to the extent of such deficit, and in that event shall bear his or their proportion of any loss.

It is further understood and agreed that in no event shall this company be liable for any amount in excess of the sum hereby insured. Total insurance permitted is hereby limited to three-fourths of the cash value of the property hereby covered and to be concurrent herewith.

Warranted that in event of loss or damage the adjustment and settlement of same shall be had in the State of Wisconsin only, and no suit in court shall be brought under this policy except in the State of Wisconsin.

THREE-FOURTHS VALUE CLAUSE.

It is a condition of this policy that in event of loss or damage by fire to the property insured this company shall not be liable for an amount greater than three-fourths of the cash market value of the same (not exceeding the amount of said policy) at the time immediately preceding such loss or damage; and in the event of other insurance on the property insured then this company shall be liable only for its proportion of three-fourths of such cash market value at the time of the fire.

INSURANCE AND INDEMNITY LIMIT.

It is part of the consideration of this policy and a basis upon which the rate of premium is fixed, that in the event of loss this company shall not be liable for an amount greater than three-fourths of the actual cash value of the property covered by this policy at the time of such loss, and in case of other insurance, whether policies are concurrent or not, then for only its pro rata proportion of such three-fourths value.

Total insurance is hereby limited to three-fourths of the cash value of the property hereby covered and to be concurrent herewith.

Minnesota Standard Policy,

PERCENTAGE VALUE CLAUSE.

If at the time of fire the whole amount of insurance on the property covered by this policy shall exceed seventy-five per cent of the actual cash value thereof, this company, in case of loss or damage, shall not be liable to pay more than its pro rata share of said seventy-five per cent of the actual cash value of such property; and should the whole insurance at the time of fire exceed the said per cent, a pro rata return of premium on such excess of insurance from the time of the fire to the expiration of this policy shall be made on surrender of the policy.

MICHIGAN LUMBER.—FOUR-FIFTHS CLAUSE.

On lumber, lath and pickets, owned or held by   in trust or on commission, or sold but not delivered, piled on the   , situate at   , Mich., warranted by the assured that a continuous clear space of   feet shall hereafter be maintained between the property hereby insured and any wood-working or manufacturing establishment, and that said space shall not be used for handling or piling lumber, lath and pickets thereon for temporary or other purposes (tramways, upon which lumber, lath and pickets are not piled, alone being excepted); but this shall not be construed to prohibit loading or unloading within, or the transportation of lumber and timber products across such clear space. It being especially understood and agreed by the assured that any violation of this warranty shall render this policy null and void.

It is a part of the consideration of this policy and the basis upon which the rate of premium is fixed, that the assured shall maintain insurance on the property hereby insured by this policy, to the extent of four-fifths of the actual cash value thereof, and that failing so to do the assured shall be an insurer to the extent of such deficit, and in that event shall bear his, her or their proportion of any loss.

It is, however, mutually understood and agreed, that in case the total insurance shall exceed four-fifths of the whole cash value of the property insured by this policy, the assured shall not recover from this company more than its pro rata share of four-fifths of the whole actual cash value of such property.

With clear space of 200 feet....................	$2.50
With clear space of 150 feet....................	2.75
With clear space of 100 feet....................	3.00
Less than 100 feet..............................	Mill rate.

Michigan Standard Policy,

LUMBER CLAUSE.

On lumber (lath and shingles, if any) owned by   or held in trust or on commission, or sold but not delivered, piled.

Space Clause.—Warranted by the assured that a continuous clear space of   feet shall hereafter be maintained between the property hereby insured, and any woodworking or manufacturing establishment, and that said space shall not be used for handling or piling of lumber thereon for temporary purposes, tramways, upon which lumber is not piled, alone being excepted. But this shall not be construed to prohibit loading or unloading within, or the transportation of lumber and timber products across such clear space; it being especially understood and agreed by the assured that any violation of this warranty shall render this policy null and void.

Four-Fifths Clause.—It is part of the consideration of this policy and the basis upon which the rate of premium is fixed, that the assured shall maintain insurance on the property hereby insured by this policy, to the extent of four-fifths of the actual cash value thereof, and that failing so to do, the assured shall be a co-insurer to the extent of such deficit, and in that event shall bear his, her or their proportion of any loss. It is, however, mutually understood and agreed that in case the total insurance shall exceed four-fifths of the whole actual cash value of the property insured by this policy, the assured shall not recover from this company more than its pro rata share of four-fifths of the whole actual cash value of such property.

GRADED GRAIN.—NEW YORK FORM.

It is understood and agreed, that this policy is subject to the conditions of the following warehouse receipts:

All warehouse receipts for graded grain which shall represent the grain as stored in a system of two or more warehouses, shall not be deemed regular unless the following condition is incorporated in the receipt:

In case of loss or damage by fire, so much of the said grain as shall bear a like proportion to this receipt, as the lost or damaged grain of same grade shall bear to all grain of like grade in this system of warehouses at the date of said disaster, shall be adjudged lost or damaged, and the obligation to deliver it under this receipt, except as salvage, canceled.

It is also understood that in case of loss under this policy, this company shall be liable only for such proportion of the whole loss as the amount of this insurance bears to the cash value at the time of the fire, of the whole property to which this policy applies, but not exceeding the proportion which this policy bears to the whole amount of insurance thereon.

It is further understood that what is known as identity preserved grain, is not covered by this policy.

SIMPLE VACANCY PRIVILEGE.

Privileged for the premises to remain unoccupied during a portion of the year, but in charge of a competent person.

Minnesota Standard Policy,

LIGHTNING CLAUSE.

This policy shall cover any direct loss or damage caused by lightning (meaning thereby the commonly accepted use of the term lightning, and in no case to include loss or damage by cyclone, tornado or wind-storm), not exceeding the sum insured, nor the interest of the insured in the property, and subject in all other respects to the terms and conditions of this policy. Provided, however, if there shall be any other insurance on said property this company shall be liable only pro rata with such other insurance for any direct loss by lightning, whether such other insurance be against direct loss by lightning or not.

GASOLINE STOVE PERMIT.

Permission is hereby given to use one gasoline stove in the dwelling insured under this policy, but only upon the conditions and under the restrictions following and in consideration of the observance of the same on the part of the insured, viz.: A supply of gasoline not exceeding five gallons may be kept in a tight and entirely closed metallic can, free from leak but not within twenty-five feet of said dwelling and additions thereto. No stove reservoir to be filled or any gasoline can or package to be opened, or gasoline to be in any manner handled except by daylight, and then not in the same room or rooms adjoining (having open communication) where or while any fire, blaze or artificial light or flame of any kind is burning.

In consideration of the above permission, for which no extra charge is made,

It is understood and agreed between this company and the insured that in case of loss on property insured under this policy during the time for which the above permit is granted this company shall not be liable for more than its proportion of two-thirds the actual cash value thereof at the time of the loss, and not exceeding the amount insured, the insured being hereby made a co-insurer thereon to the extent of one-third thereof.

GASOLINE IS DANGEROUS TO LIFE AND PROPERTY.

In consideration of dollars, extra premium, permission is hereby given for the using of a gasoline stove, the reservoir to be filled by daylight only, and when the stove is not in use. Warranted by the insured that no artificial light be permitted in the room when the reservoir is being filled, and no gasoline, except that contained in the reservoir, shall be kept within the building, and not more than five gallons, in a tight and entirely closed metallic can, free from leak, on the premises adjacent thereto.

To be attached to Policy No. , Insurance Co.
Dated this day of 190 , agent
at

Caution.—The danger from gasoline stoves is not so much in themselves as in the having the gasoline about. At ordinary temperature gasoline continually gives off inflammable vapor, and a light some distance from it will ignite it through the medium of this vapor. It is said that one pint of gasoline will impregnate 200 cubic feet of air and make it explosive, and it depends upon the proportion of air and vapor whether it becomes a burning gas or a destructive explosive. Beware of any leaks in cans, and never forget how dangerous a material you are handling. Never attempt to fill the stove reservoir while the stove is burning, or if any other light is in the room. A little carelessness may hazard your life as well as property.

KEROSENE OIL STOVE PERMIT.

Permission is hereby given to use in the above-mentioned premises one kerosene oil stove, provided kerosene of the standard of 150 degrees or more is used. Reservoir to be filled when cold by daylight only; said stove to be securely fastened to prevent its overturning, otherwise this policy is rendered null and void.

The use of gasoline is prohibited under any circumstances whatever.

COAL OIL AND GUNPOWDER PERMIT.

Permission granted to keep for sale not to exceed pounds of gunpowder and five barrels of kerosene oil (which shall not be less than the United States standard of 110 degrees); warranted by the assured that neither will be handled nor sold within fifteen feet of artificial light.

This form is attached to, and made a part of, Policy No.
of the Insurance Company of
agent.

Twenty-five pounds of gunpowder generally, but in some sections fifty pounds.

PERMIT FOR KEEPING GASOLINE, BENZINE OR NAPHTHA.

MERCANTILE RISKS.

In consideration of $ extra premium, permission is granted to keep on the premises, not to exceed gallons in all, of gasoline, benzine, naphtha, or any other of the light products of petroleum. The same to be kept in close metallic cans, free from leak; warranted by the assured that the drawing of the same shall be done by daylight only, and that no artificial light shall be permitted in the room where such fluids are kept.

NATURAL GAS PERMIT.

Permission is hereby granted to use natural gas for fuel and lights, provided the pressure in the pipes and at the burners does not exceed two (2) pounds to the square inch and is controlled by a pressure regulator, attached to the service pipe outside of the building, such regulator to be arranged to automatically close the inlet pipe in case the flow of gas fails from any cause.

PERMIT TO USE EARTH OIL FOR FUEL WITHOUT GRAVITY PRESSURE.

Permission is granted to use earth oil for fuel in generating steam on the premises described in this policy, upon the following express conditions only, agreement to observe which on the part of the assured is hereby made a warranty.

The tank for the storage of the oil supply shall be of boiler iron, having proper ventilation for the escape of inflammable vapors, and located not less than 100 feet from the premises described if wholly underground, or 200 feet if wholly or in part above ground, and shall be so placed that the highest point in said oil supply shall be lower than the furnace where such oil is to be burned or converted for burning.

The pipe used for conveying oil to said furnace to be so laid that when not in use the flow of oil, if any, will be away from the premises and back to the storage tank; it being the intention of the parties hereto to provide against the conveying of oil to the place of burning by gravity pressure, or by any other process, from a supply higher than the place of use thereof.

It is further stipulated that if said storage supply tank is wholly or partly above ground, it shall not be located within one hundred feet of any other building more than one story high, and shall be surrounded by a wall or earth embankment of sufficient capacity to contain the contents of said tank in case of a leakage or bursting.

The foregoing conditions being at all times fully complied with, this permit is to remain in force free of charge, otherwise the entire policy to which this is attached and all insurance thereunder shall be void and of no effect.

ORDINARY MECHANICS' PRIVILEGE.

Permission for mechanics to be employed for ordinary alterations and repairs in the within described premises, but this shall not be held to include the constructing or reconstructing of the building or buildings, or additions or the enlargement of the premises.

ELECTRIC LIGHT PRIVILEGE.

Privileged to use electric light in the premises herein described when the entire equipment is in full compliance with the standard of the New York Board of Fire Underwriters existing at the time of the commencement of this policy, and a certificate is given by the Electric Light Co. to that effect; it being understood that no alteration shall be made in the equipment without written consent of this company.

ELECTRIC LIGHT PERMIT.

Permission granted to use electric lights. Wires to be doubly coated with approved insulating material, and to have at least double the conducting capacity required by the generators, and to be protected where they enter the buildings by porcelain or hard rubber insulators, with cut-off outside. Lamp frames to be insulated, and to have globes closed at the bottom, and at the top by chimney with spark-arresters where inflammable materials are exposed.

Minnesota Standard Policy,

APPLICATION AND SURVEY CLAUSE.

This policy is based upon an application and survey of the property on file which is hereby referred to as forming part of this policy. Date of application. Where filed.

N. Y. Standard,

CONDITION AS TO INCUMBRANCES.

If the property, real or personal, covered by this policy be or become incumbered by a mortgage, trust deed, judgment or otherwise, this entire policy shall be void, unless otherwise provided by agreement indorsed hereon or added thereto.

IRON SAFE CLAUSE.

The assured under this policy hereby covenants and warrants to keep a set of books, showing a complete record of business transacted, including all purchases and sales both for cash and credit, together with the last inventory of stock insured; and further covenants and warrants to keep such books and inventory securely locked in a fireproof safe at night and at all times when the store mentioned in the within policy is not actually open for business, or in some secure place not exposed to a fire which would destroy the house where such business is carried on; and in case of loss, the assured warrants and covenants to produce such books and inventory, and in the event of a failure to produce the same this policy shall be deemed null and void, and no suit or action at law shall be maintained thereon for any such loss.

SPACE CLAUSE.

Warranted by the assured that a continuous clear space of feet shall be maintained between the property hereby insured and any special hazard or manufacturing risk, and that any violation of this warranty shall render this policy void.

LUMBER YARD.—SPACE CLAUSE.

Warranted by the assured that a continuous clear space of feet shall hereafter be maintained between the property hereby insured and any woodworking or manufacturing establishment, and the said space shall not be used for the handling or piling of lumber thereon for temporary purposes; tramways, upon which lumber is not piled, alone being excepted; but this shall not be construed to prohibit loading or unloading within, or the transportation of lumber and timber products across such clear space; it being specially understood and agreed by the assured that any violation of this warranty shall render this policy null and void.

CASKS OF WATER.

Warranted, that the assured will keep full of water at least three casks, of not less than thirty gallons capacity each, on every floor, with four metal buckets to each cask, unless otherwise specially agreed to by the committee on tariff.

STAND-PIPE.

Warranted, that the assured will maintain a stand-pipe of not less than three inches in diameter, connected with tank on roof (for fire extinguishing only) supplied by force pump and city water supply, with sufficient hose of 2½ inches in diameter, attached on each floor to reach any part of the floor.

N. Y. Standard,

ASSESSMENT, INSTALMENT OR CREDIT CLAUSE.

If any assessment or instalment, or any part of the premium for which credit is given be not paid when due, the whole premium shall be considered earned and be immediately payable, and this policy shall be void so long as any part of such premium remains unpaid.

NEW YORK AUTOMATIC SPRINKLERS CLAUSE.

It is hereby made a condition of this policy, that the assured shall use due diligence to maintain in full working order during the term of this insurance, the automatic sprinkler equipment now in use and approved by the New York Board of Fire Underwriters, and that no change shall be made in such system without the approval of said board.

If the sprinkler equipment is not automatically connected with a central fire alarm station and approved by said board, the assured shall maintain a watchman during all hours when the premises are not regularly in operation and when closed.

WATCHMAN.

Warranted to maintain night, Sunday and holiday watchman, with approved stations and approved watch clock, and making such reports to the New York Fire Insurance Exchange as may be required.

WATCHMAN CLAUSE.—DISTILLERS.

Warranted by the assured, that at all times when the property herein described shall be idle or inoperative, a constant day and night watchman shall be kept on duty; and provided, that if said property be idle, or shut down, for more than thirty days at any one time, notice must be given this company, and permission to remain idle for such time must be indorsed hereon, or this policy shall immediately cease and determine.

WARRANTEE FOR THEATRES.

Warranted, that the assured will maintain a night and Sunday watchman—with watch clock—having stations on each floor of the building, and on stage, and each gallery, and in property room, repair shop and paint shop, and a special building call connected with fire department headquarters.

Warranted, that the assured will keep a forty-gallon barrel filled with water, also six buckets filled with water, one fire extinguisher, two axes and two hooks on each fly gallery on each side of stage, and in property room, repair shop and paint shop.

AUTOMATIC FIRE ALARM.—FULL EQUIPMENT.

The entire building containing the property hereby insured, having been equipped with the automatic fire alarm signal telegraph in accordance with the rules and regulations of the New York Board of Fire Underwriters, and a certificate to that effect issued by authority of said board, this policy is issued at a reduced rate of premium, and in consideration of such reduced rate, it is hereby made a condition of this policy, that the assured shall use due diligence that such equipment shall continue to be maintained during the full term of this insurance.

EXPOSURE CLAUSE.

It is hereby agreed and understood that in the event of the erection of any new building within eighty feet of the one hereby insured, or containing the property insured under this policy, whether the said new building be owned or controlled by the assured or by some other person, the assured shall, within five days after work shall commence on said new building, notify the agent issuing the policy of the erection of such new building, such notice to be by registered letter, directed to the agent who issues the policy to the post-office where he resides. A failure on the part of the assured to give the notice herein required within five days after the work on such new building shall begin shall render this policy null and void.

MANUFACTURING PRIVILEGE.—N. Y. DRY GOODS DISTRICT.

Privilege is hereby granted to cut, sew, press and manufacture any article of merchandise hereby insured with the use of one stove in such work, provided that the aggregate number of persons employed by the assured in all such work shall be limited to twenty.

VACANCY CLAUSE.

Permission is hereby given that the building described in this policy may remain vacant for   from date, to-wit.: From the   day of   , 190 , to the   day of   , 190 . Additional premium, $

It is understood and agreed between the company and the assured, that the building shall be under the supervision and care of some competent person during said time, and the doors and windows securely closed and locked, and all rubbish removed from said building; otherwise this policy is null and void.

STEAM THRESHING PERMIT.

In consideration of $ additional premium, permission is hereby given to use steam power for threshing, for   days from date; it being understood that this indemnity is granted upon the terms, conditions and restrictions named in said policy, and also and especially the following:

1st. While there is fire in the furnace of the engine it shall not be located within twenty feet of any building or stack; no combustible litter shall be allowed to collect or remain within fifteen feet of the furnace, a mesh or screen of wire in perfect order and of the best kind for arresting sparks, shall constantly and completely cover the top of the smoke-stack; a competent watchman shall be in constant attendance upon the furnace, and at least three pails, filled with water, and ready for use, shall be kept within ten feet of the furnace.

2d. The boiler and furnace shall be in good condition, and furnished with all modern appliances for safety against fire, and hard or bituminous coal, or hardwood only, shall be used for fuel.

Violation or non-observance of these conditions or restrictions will render this policy void.

DOUBLE LINE.—EXCEPTION CLAUSE.

It is hereby understood and agreed that if, at the happening of any loss or damage by fire to the above-described property during the term of this policy, there should exist other insurance thereon in this company, whether by any other policy or policies, or binder or binders, or any other agreement or agreements, oral or written, whatsoever, this policy shall be null and void, and bear, in consequence, no share or proportion of said loss or damage.

LIVE STOCK CLAUSE.—CONSEQUENTIAL DAMAGES.

It is hereby mutually understood and agreed, that no claim shall be made under this policy for any consequential damages arising from loss of feed, or from exposure, or for any loss not the direct result of fire and exposure thereto to said live stock while contained in premises above described.

REINSURANCE CLAUSE.—STORAGE FORM.

This policy is subject to the same risks, conditions, valuations, and modes of settlement as are or may be assumed by said and loss, if any, payable pro rata with the total amount insured by said company, and at same time and in same manner as they pay.

Other reinsurance permitted without notice until required.

This phrase "total amount" is inserted to protect the reinsuring company from assessment for loss upon any special lot of insurance which might be made to lighten unduly the loss to the company reinsured.

N. Y. Standard,

MORTGAGEE CLAUSE WITH FULL CONTRIBUTION.

Loss or damage, if any, under this policy shall be payable to as mortgagee (or trustee) as interest may appear, and this insurance, as to the interest of the mortgagee (or trustee) only therein, shall not be invalidated by any act or neglect of the mortgagor or owner of the within described property, nor by any foreclosure or other proceedings or notice of sale relating to the property, nor by any change in the title or ownership of the property, nor by the occupation of the premises for purposes more hazardous than are permitted by this policy; provided, that in case the mortgagor or owner shall neglect to pay any premium due under this policy, the mortgagee (or trustee) shall, on demand, pay the same.

Provided also, that the mortgagee (or trustee) shall notify this company of any change of ownership or occupancy or increase of hazard which shall come to the knowledge of said mortgagee (or trustee), and, unless permitted by this policy, it shall be noted thereon, and the mortgagee (or trustee) shall, on demand pay the premium for such increased hazard for the term of the use thereof; otherwise this policy shall be null and void.

This company reserves the right to cancel this policy at any time as provided by its terms, but in such case this policy shall continue in force for the benefit only of the mortgagee (or trustee) for ten days after notice to the mortgagee (or trustee) of such cancellation and shall then cease, and this company shall have the right on like notice to cancel this agreement.

In case of any other insurance upon the within described property this company shall not be liable under this policy for a greater proportion of any loss or damage sustained than the sum hereby insured bears to the whole amount of insurance on said property issued to or held by any party or parties having an insurable interest therein, whether as owner, mortgagee or otherwise.

Whenever this company shall pay the mortgagee (or trustee) any sum for loss or damage under this policy, and shall claim that as to the mortgagor or owner no liability therefor existed, this company shall, to the extent of such payment, be thereupon legally subrogated to all the rights of the party to whom such payment shall be made, under all securities held as collateral to the mortgage debt, or may at its option pay to the mortgagee (or trustee) the whole principal due or to grow due on the mortgage with interest, and shall thereupon receive a full assignment and transfer of the mortgage and of all such other securities, but no subrogation shall impair the right of the mortgagee (or trustee) to recover the full amount of claim.

The difference between the above mortgagee clause and the one immediately following it lies in the fourth paragraph of the above, which provides that all the insurance, whether by owner or mortgagee, separately or jointly, shall be taken into account in determining the loss under the policy with the above clause.

N. Y. Standard,

MORTGAGEE CLAUSE.

Loss or damage, if any, under this policy shall be payable to mortgagee (or trustee) as interest may appear, and this insurance as to the interest of the mortgagee (or trustee) only therein shall not be invalidated by any act or neglect of the mortgagor or owner of the within described property, nor by any foreclosure or other proceedings or notice of sale relating to the property, nor by any change in the title or ownership of the property, nor by the occupation of the premises for purposes more hazardous than are permitted by this policy; provided, that in case the mortgagor or owner shall neglect to pay any premium due under this policy the mortgagee (or trustee) shall on demand pay the same.

Provided also, that the mortgagee (or trustee) shall notify this company of any change of ownership or occupancy or increase of hazard which shall come to the knowledge of said mortgagee (or trustee), and, unless permitted by this policy, it shall be noted thereon and the mortgagee (or trustee) shall, on demand, pay the premium for such increased hazard for the term of the use thereof; otherwise this policy shall be null and void.

This company reserves the right to cancel this policy at any time as provided by its terms, but in such case this policy shall continue in force for the benefit only of the mortgagee (or trustee) for ten days after notice to the mortgagee (or trustee) of such cancellation and shall then cease, and this company shall have the right on like notice to cancel this agreement.

Whenever this company shall pay the mortgagee (or trustee) any sum for loss or damage under this policy, and shall claim that as to the mortgagor or owner no liability therefor existed, this company shall, to the extent of such payment, be thereupon legally subrogated to all the rights of the party to whom such payment shall be made, under all securities held as collateral to the mortgage debt, or may at its option pay to the mortgagee (or trustee) the whole principal due or to grow due on the mortgage with interest, and shall thereupon receive a full assignment and transfer of the mortgage and of all such other securities, but no subrogation shall impair the right of the mortagee (or trustee) to recover the full amount of claim.

MORTGAGEE CLAUSE.—WHEN OWNER HAS NO INTEREST IN THE INSURANCE.

It is hereby specially understood and agreed that this policy is for the benefit of the mortgagee (or trustee) only, the owner having no interest whatever therein.

And it is further agreed that whenever this company shall pay the morgtagee any sum for loss under this policy this company shall at once be legally subrogated to all the rights of the mortgagee (or trustee) under all the securities held as collateral to the mortgage debt to the extent of such payment, but such subrogation shall not impair the right of the mortgagee (or trustee) to recover the full amount of his claim.

USE AND OCCUPANCY FORM.

$ on the use and occupancy of manufacturing buildings situate at and known as

The conditions of this contract of insurance are, that if any of the buildings used for manufacturing purposes or machinery therein, shall be so disabled by fire occurring during the term and under the conditions of this policy, that they are entirely prevented from manufacturing, then this company shall be liable at the rate of dollars per day for each working day of such prevention; and in case the said buildings, or machinery therein, are so disabled by fire as to prevent the full daily average product, this company will be liable per day for that proportion of dollars which the product so prevented from being made bears to the average daily yield previous to the fire, which for the purposes of this insurance is agreed to be the full daily average for working days immediately preceding the fire, not exceeding in either case the amount insured. Loss, if any, to be computed from the day of the occurrence of any fire, to the time when the said buildings or machinery therein could with ordinary diligence and dispatch be repaired or rebuilt and machinery be replaced therein, and not limited to the day of expiration named in this policy.

Permission is given to make additions, alterations and repairs; to run machinery extra hours, but not later than 10 o'clock P. M.; to use kerosene oil for lights, to have and make other insurance without notice until requested.

In case of loss, this policy shall attach on the use and occupancy of each mill in proportion as the value of the daily average product of each mill, for the working days immediately preceding the fire shall bear to the value of the daily average product of all the mills for the same time.

LEASEHOLD INTEREST.—TENANT'S FORM.

On leasehold interest (term of rent from to) in the

It is specially understood and agreed, that if said building shall be totally destroyed by fire this company shall pay the whole amount hereby insured, less a deduction of dollars per month for the time that shall have elapsed between the date of and the date of occurrence of said fire. And in case of such damage by fire as shall, without total destruction, render said building untenantable, this company shall pay at the rate of dollars per month, to be computed from the date of such fire to the date at which, by due diligence, the said building could be repaired and rendered fit for occupancy; and in no case shall this company be liable for a greater amount than the sum insured; nor for any loss other than that which may arise under said leasehold interest.

RENT POLICY.

$ on the rent of the story and basement roof building, owned by and occupied by tenants, situated

The conditions of this insurance are: That if these premises, or any part thereof, shall be rendered untenantable by fire, so as to cause an actual loss of rents to the assured, then this company shall be liable for such loss of rents, not exceeding the sum insured. And the assured agree to rebuild or repair said premises in as short a time as the nature of the case will admit. Loss to be computed from the date of the fire, and to cease upon the premises again becoming tenantable. And in case the assured shall elect not to rebuild or repair, then the loss of rents shall be determined by the time which would have been required for such purpose.

Other insurance permitted without further notice until required.

TRANSFER OF OWNERSHIP.

New York, , 190 . This company hereby recognizes as the owner of the property described in this policy, the title having been transferred to . Loss, if any, payable

TRANSFER OF LOCATION.

New York, 190 . This insurance is hereby transferred to cover property as herein described, while contained in the building situate in occupied

LEASED GROUND CLAUSE.

It is understood that the building described herein stands on leased ground.

AS NOW OR MAY BE HEREAFTER CONSTITUTED.

The words after the name of the assured are frequently used to render needless any indorsement of transfer of interest when additional members are admitted to the firm, or when a portion of the members withdraw—provided the firm name remains unchanged.

COMPLETION CLAUSE.

Privileged for mechanics to complete said building.

DUPLICATE.

This is furnished simply as a memorandum of said policy as it stands at the date of issue thereof, and is given as a matter of information only, and confers no rights on the holders.

Said original policy is subject to endorsement, alteration, transfer, assignment and cancellation without notice to the holder of this copy.

FLOATING POLICY EXEMPTIONS.

It is understood and agreed that any floating policies held by the assured are not to be considered as contributing insurance in case of loss under this policy.

This clause is entered on specific policies to avoid collision between the two classes of insurance in the event of fire. The specific insurance is exhausted before the floating insurance applies.

LOSS PAYABLE CLAUSE.

The Insurance Company of hereby consents that the loss, if any, under this policy after the same shall have been ascertained and duly verified by the assured shall be payable to for and on account of said assured.

After a loss has occurred the claim upon the company is frequently assigned to some debtor to diminish or cancel a debt of the assured, or in some cases the claim is sold by the assured. The preceding is a form of consent given by the company.

WHARF CLAUSE FOR STORAGE INSURANCE

This policy also covers on merchandise as above ordered to said store (except when protected by marine insurance) while on streets adjoining said store, or on piers or bulkheads belonging thereto for a period of ten days from the date of this policy.

It is customary where the concession is asked for in New York to grant a ten days' privilege under a storage store policy, covering the merchandise on the wharf or pier of unlading. The object of this clause is to keep track of such pier risks and so prevent double lines there.

RATE CLAUSE.

It is expressly stipulated that in event of loss when other insurance on the property exists at a higher rate of premium then in such case this insurance shall contribute in the proportion which the rate of premium paid for this insurance bears to the highest premium rate paid.

It has often happened that after the occurrence of fire the insurance on the property was at various widely differing rates, and this clause has been devised to equalize the liability so that the number of dollars of premium actually paid determines the amount of loss to the company.

SPECIAL LIMITATION OF LIABILITY.

This company is liable under this policy only in case of loss and damage occurring to the property hereby insured, in excess of per cent of the value thereof as determined by careful adjustment, but in no case shall this policy contribute to the payment of such loss or damage with any other policy or insurance not so limited as to liability.

In case such other insurance exceeds at the time of fire such per cent of value of the property insured hereunder this company shall be liable under this policy only for its just proportion of the excess of such loss and damage over and above said other insurance.

It is the special consideration in virtue of which the said assured accepts the above conditions and agrees that the same shall form part of this policy, that a rebate of per cent is deducted from the full premium thereof.

Attached to and forming part of Policy No. , issued by Insurance Company.

Full premium $. Rebate $ $

The above clause is intended for those establishments where the high rate of hazard, or the large amount of property subject to one fire, prevents the assured from securing full protection. In this case companies may assume lines in an amount above their ordinary limit, with the restriction that the loss must reach a certain proportion of value to render these additional insurances liable. Some companies would prefer the full premium with full liability, others would incline to offer a reduction of rate for the restriction of liability. If such insurance is obtained all the other companies must be advised and an agreement such as the following attached to such of their policies which are without this limitation:

NOTICE OF OTHER INSURANCE UNDER SPECIAL LIMITATION AS TO LIABILITY.

It is understood and agreed that all policies of insurance on the property hereby insured, written under the "Special Limitation of Liability Clause"—that is to say, policies under which by their terms no liability exists for loss and damage unless such loss and damage resulting from any fire shall exceed a stated percentage of the value of the property aforesaid—do not contribute with this policy for the payment of such loss and damage.

FULL CO-INSURANCE CLAUSE.

In consideration of the premium for which this policy is issued it is expressly stipulated that, in the event of loss, this company shall be liable for no greater proportion thereof than the sum hereby insured bears to the cash value of the property described herein at the time when such loss shall happen; nor more than the proportion which this policy bears to the total insurance. If this policy be divided into two or more items these conditions shall apply to each item separately. Provided, however, that if the aggregate claim for any loss shall not exceed five per cent of the total insurance, no special inventory or appraisement of the undamaged property shall be required.

EIGHTY PER CENT CO-INSURANCE CLAUSE.

In consideration of the premium for which this policy is issued it is expressly stipulated that in the event of loss, this company shall be liable for no greater proportion thereof than the sum hereby insured bears to eighty per cent of the cash value of the property described herein at the time when such loss shall happen; nor more than the proportion which this policy bears to the total insurance. If this policy be divided into two or more items these conditions shall apply to each item separately. Provided, however, that if the aggregate claim for any loss shall not exceed five per cent of the total insurance, no special inventory or appraisement of the undamaged property shall be required.

ELECTRIC LIGHT CLAUSE.—FOR CONTENTS.

Privileged to use electric lights in the above mentioned premises, when a certificate is obtained from the New York Board of Fire Underwriters.

No alterations shall be made in the equipment after certificate is issued without written approval from said board.

ELECTRIC LIGHT CLAUSE.—FOR BUILDINGS.

Privileged to use electric lights in the above-mentioned premises, when a certificate is obtained from the New York Board of Fire Underwriters.

No alterations shall be made in the equipment after certificate is issued without written approval from said board.

This insurance shall not cover any loss or damage to dynamos, exciters, lamps, motors, switches, or any other apparatus for generating, utilizing, testing, regulating, or distributing electricity, caused by electric current, whether artificial or natural.

MECHANICS' PRIVILEGE.

Permission for mechanics to be employed for ordinary alterations and repairs in the within described premises, but this shall not be held to include the constructing or reconstructing of the building or buildings, or additions or the enlargement of the premises.

TRANSFER OF LOCATION.

New York, 18 . This insurance is hereby transferred to cover property as herein described, contained in the building privileged to be occupied as situate

VESTED INTEREST.

The interest in this policy is now vested in

CHANGE OF FORM.

This policy hereafter covers as per this form substituted 18 , and not as heretofore.

Subject to co-insurance clause attached to Policy No.
Secretary C. D.

OPERATING AND MECHANICS' PRIVILEGE.

Privilege is hereby given to operate the within described premises at all hours, and to employ mechanics in making ordinary alterations and repairs, without limit of time.

REINSURANCE CLAUSE.

It is hereby understood and agreed as a condition of this reinsurance, that the reinsured company shall retain on the identical property herein described, and upon which this reinsurance is effected above all reinsurance, a sum, at least equal to the total amount of reinsurance of said reinsured company held by this company on said property; and failing to do so, this company shall not be liable for a greater amount than that retained by the reinsured company for its sole account.

PRINTED CONDITIONS RULE.

The use of general terms in the written portion of this policy shall not be held to nullify or invalidate the printed conditions herein.

LEASED GROUND CLAUSE.

It is understood that the above described building stands on leased ground.

COINSURANCE CLAUSE FOR FLOATING POLICY.

It is hereby declared and agreed, that in case the property aforesaid in all the buildings, places or limits included in this insurance, shall, at the breaking out of any fire or fires, be collectively of greater value than the sum insured, then this company shall pay and make good to the insured such a portion only of the loss or damages as the sum insured shall bear to the whole value of the property aforesaid, at the time when such fire or fires shall first happen.

NEW YORK FIRE INSURANCE EXCHANGE'S FORM.—CHURCH, CHAPEL OR SUNDAY SCHOOL, WITHOUT STEAM HEAT WARRANTY.

$ on the building occupied for church purposes situate .

This item covers all adjoining additions and extensions thereto, if communicating, sidewalks, yards fences, railings, pews, pulpits, window, plate and ornamental glass, frescoing, gilding and plain and ornamental painting, gas, water and heating pipes, apparatus, fixtures and all appliances pertaining thereto.

$ on dynamos and all electric and mechanical apparatus and appurtenances thereto belonging.

$ on church, altar, school and other movable furniture, useful and ornamental, carpets, floor coverings, paintings, pictures, engravings and their frames, musical instruments (excepting pipe organs), statuary stations, vestments, plate, printed books and music, church and school paraphernalia and supplies.

$ on pipe organs—all while contained in the above described premises.

THE RATING OF FIRE HAZARDS.

The two main considerations in the fixing of fire insurance rates are construction and protection. It is plain that a well constructed edifice which is as nearly as possible fireproof, is much less likely to burn than is a light frame structure; hence the former would justly pay a much lower premium for fire insurance than would the latter. It is also clear that, among buildings of the same class, those which are equipped with approved protective devices should pay a lower rate than those which are not so protected. The ordinary methods of rating now in vogue do not, in many instances, yield the same results in different sections of the country, although the circumstances in the respective sections may be almost identical. Rate making has not yet been reduced to a science, though some steps have been taken in that direction. A few years ago a number of representative underwriters produced what was styled the "Standard Universal Schedule for Rating Mercantile Risks." The basis of this plan for assessing fair and equitable premium rates upon all mercantile hazards was a "Standard Building" in a "Standard City." After specifying the conditions necessary in a "Standard City," the schedule gives the description of a "Standard Building."

The basis rate for a "Standard Building" in a "Standard City" is fixed at twenty-five cents per $100 of insurance. Starting with this basis rate, additions to or deductions from it are made for all variations from standard until the final rate for the unoccupied building is arrived at. Then the charge for occupancy, dependent upon the purpose for which the building is used, is added to this sum to learn the rate for the building as occupied. To get the rate upon the stock of goods carried, another sum, varying according to the nature of the business conducted, is added to the unoccupied building rate.

This method of rating has been tested in a few cities, but makes slow headway. As it secures equitable ratings as between risks, it commends itself to business men. Its tendency is to encourage better construction, which, with the necessarily thorough inspections, will reduce the liability of fire.

Under the present methods of making rates, they are usually fixed by a local board of underwriters (who are in numerous places governed by a schedule of local application), and are generally quite consistent in a given locality, while they may not harmonize well throughout the country. Although a schedule system of rating appeals to the reason of the average business man, it is doubtful whether rates would actually be any fairer under such a system than they now are. A schedule is supposed to contain or represent the collated results of the actual experience of a considerable number of insurance companies with each particular class of risks. Even if this should be true, the results are not deduced from constant factors, and are, therefore, as likely to err, so far as the ratio between cost and selling price of insurance is concerned, as are the rates made under the existing methods. That this is a fact is evidenced by the experience of a leading company, which, believing a certain class of property a fair risk at a given rate, proceeded to insure such property to a considerable amount. It lost money upon this class, not only for one year, but for several successive years. A careful inspection of the circumstances in the case of each fire confirmed the former decision that this class *should* yield a profit at the company's rates, and it was determined to follow the same course for a year or so more. This was done, and the decision was justified by the event. But if the experience of the losing years had been those upon which a permanent schedule had been based (and it is reasonable to assume that most companies writing the same class of business had a similar experience) the propertyowner would have been required to pay too high a rate during the later years, so that it is apparent that schedule rating is not necessarily any more accurate than is the present-day plan. As insurance companies must *first sell* their goods and *later buy* them at a previously unknown price, it will be readily conceded that, with a vigorous competition, the temptation to sell at too low a price is very strong—much more so than in the case of a merchant selling goods of which he has figured the actual cost down to a cent. The merchant knows that to sell at a given price means loss; the underwriter cannot know until months or years later whether his transactions will yield profit or loss, and is prone to be guided by hope, rather than judgment, and accept risks whose outcome is unprofitable. In general, it may be accepted as a fact that fire insurance rates, however made, are seldom unfairly high; indeed, underwriters are always glad to make reductions when they are warranted by improved conditions. It is probably no exaggeration to say that they would willingly cut all rates in two if they could do so, and be guaranteed a most moderate margin of profit—for profits are most elusive in the underwriting business.

HINTS TO THE INSURED.

Below will be found a number of hints which may prove useful in the avoidance of fire loss or in securing indemnification therefor. For policy requirements on any particular point, see Policy Index:

If you hold a policy of a company which is not regularly licensed to do business in your State, read it carefully—it may differ vitally from the ordinary standard policy.

Certain things are specifically permitted by standard policies; others are strictly prohibited. When in doubt consult the Policy Index.

Explosives must not be used or stored, except under prescribed conditions or by special permission.

If your property is mortgaged, be certain that you have complied with policy requirements respecting mortgaged property.

Permission of the insurance companies is necessary before making extensive repairs or alterations. Read the policy in this connection.

If a building is to be vacant or unoccupied longer than ten days, obtain permission from the insurance companies.

A factory may be run until 10 P. M., or closed for not exceeding ten days, without special permission.

If the insured cancels his policy, the company retains the usual short time rate; if the company cancels, it only retains a proportionate part of the premium. The company must give five days' notice of cancellation.

Under certain restrictions kerosene oil may be used and kept for sale. See policy.

Certain classes of property are especially excluded from insurance unless written in the policy or form. Among these are currency, deeds, securities, pictures, etc.

Encumbrances, changes in ownership, other insurance without permission, and various other circumstances may void policy. Be sure you have complied fully with its requirements.

Loss of rent or income by reason of fire may be insured against, but is not covered by the standard policy.

If you sustain a fire loss give immediate written notice to the companies interested, stating in round figures your estimate of the damage.

The propertyowner must use all reasonable effort to save and preserve his insured property in event of fire.

After a fire it is the owner's duty to separate the damaged from the undamaged property, and to make an inventory showing quantity and cost of each article, with the amount of damage claimed thereon.

As the policy of an insolvent company would be held to contribute proportionately in any loss, it is advisable to cancel such policy as soon as the insolvency of the company is known.

Care should be used to have all policies read alike when covering the same property.

Large floor areas are discriminated against unless divided by acceptable fire walls, with openings properly protected.

Rate reductions are made for approved fire shutters and doors.

Engines should, if possible, be located in separate brick or stone building at some distance from factory.

The installation of automatic sprinkler systems is encouraged by liberal concessions in premium rates.

Fair allowances are made by underwriters to induce the use of such devices as watchmen's clocks, chemical extinguishers, fire pails, hydrants and hose, wire glass, etc.

Factory stairways should be built outside of main building in brick addition, cut off at each floor by fire door. If inside of building they should be enclosed and cut off by doors at each floor; but the spaces under stairways should be left entirely open.

Before adopting for use in your factory or store any new device or material, inquire of your local insurance agent whether its use is approved by insurance companies; otherwise you may learn that your insurance has been vitiated.

Use metal ash cans, and keep rags and oily waste in metal cans. The latter should be kept out of doors at night.

Be exceedingly cautious with matches. Keep them in metal or other fireproof boxes. Mice and matches have caused many fires.

Make it *one* man's duty to inspect thoroughly and regularly all apparatus designed to prevent or extinguish fire or to send in an alarm; also to see that the premises are kept clean and free from anything which might feed a fire. Water casks and pails should be kept filled, sprinklers and valves in working order, gas jets properly protected, stoves and stovepipes in safe condition, etc.

By having your boilers insured against damage by explosion you can secure their regular inspection.

Be especially careful in filling and trimming oil stoves and lamps. Do it only by daylight.

Steam pipes should be covered with a suitable non-conducting material. They have been known to cause fires when in contact with or too near woodwork.

Every large establishment should have a well-organized and effective private fire department, fully equipped with good apparatus.

The division of buildings into fire sections by brick walls running up through and above the roof and cutting off cornices, with all openings protected by automatic fire doors is highly approved by underwriters. This arrangement tends to localize any fire which may occur.

All openings through walls and floors, such as doors, hatchways and belt-holes, may be protected by automatically closing doors and shutters, which are of great assistance, in event of fire occurring, in preventing its spread through the building.

Every factory of any size should be provided with a fireproof oil room, for the storage of illuminating and lubricating oils, etc. This can be constructed within the main building, if necessary, in such a manner as to materially lessen the fire risk inherent in such materials.

It is a good plan, when a plant is equipped with a dry-pipe automatic sprinkler system, and is located in a district subject to severe weather in winter, to protect the dry-pipe valves by placing them in insulated closets.

Where there is danger of an oil fire, keep pails of sand at hand. Water would help spread such a fire, while sand would quench it.

Skylights should be made of wire glass or protected from breakage by wire screens.

Floor beams should rest on ledges or in box anchors, in order that, should the floors fall during a fire, they would not pull down the outside walls.

Asbestos and other fireproof materials are now prepared in every conceivable way; so that an almost certain protection can be secured against any particular hazard.

Fireproof roofing materials are now plentiful, and should be used wherever feasible.

Beware of concealed spaces in interior woodwork. Wherever they are necessary, they should contain frequent fire stops; otherwise fire may be carried through them with great rapidity.

Walls and ceilings should be built of non-inflammable materials, the use of wood or wooden lath and plaster being discouraged by insurance men.

All windows through which fire could be communicated from an adjoining building or from another wing of the same building should be protected by automatic fire shutters.

All fire doors and shutters should be closed nights, Sundays and holidays, or whenever the building is not occupied.

It is advisable to protect openings between important divisions of a building with a fire door on each side of the wall.

Constant care must be exercised to keep all protective appliances and apparatus in good order. Dependence upon deteriorated protective devices is more dangerous than is their entire absence.

An equipment of open sprinklers on the exterior of the building is very desirable in the case of a wooden building which is exposed by another building. These should be arranged under the cornice and over each window. In some cases every window should be protected by a sprinkler.

Do not let your sprinkler equipment freeze up in winter. It may burst and inflict water damage, or it may be frozen up and ineffective when a fire occurs.

Sprinkler protection, to be effective, must be thorough. Every nook and corner must be protected or a fire may have time to grow beyond control.

Gas jets are dangerous unless surrounded by wire guards.

Every sizable factory should have, in connection with its private fire department, one or more hose houses, each sheltering a hydrant, with hose already attached and neatly laid out ready for instant use, together with axes and other necessary tools. Permanent ladders should be erected at points where they might be needed in fighting a fire.

Be certain that your supply of water for sprinklers and hydrants is always sufficient and obtainable.

Fire pumps should be located beyond reach of fire, and should be constantly in condition for immediate and protracted use at their full capacity. The "Underwriter" pattern is deemed the best style of fire pump.

A tank used to supply water to a sprinkler system should not be used for domestic purposes, as sediment is apt to accumulate and clog sprinkler pipes.

A steam coil or an open live steam pipe should be used to prevent water in tank from feezing. There should be a permanent ladder leading to gravity tank.

Heavy pressure of water, satisfactory to underwriters, may be obtained from public water works systems, private reservoirs or standpipes, air pressure tanks or automatic steam pumps.

No large mercantile or manufacturing establishment can be considered properly equipped which has no automatic fire alarm system. There are a variety of these, and they can be arranged to suit every requirement. Some of them are combined with automatic sprinklers.

Use none but frost-proof hydrants where the winters are cold enough to freeze up ordinary hydrants.

The underwriters have adopted a standard for fire hose; see that your hose is up to standard and in good condition.

Great care should be exercised in the treatment of hose. It should be kept in a well ventilated house, and should be emptied and carefully laid out on shelves after using.

Probably more fires have been put out by means of water pails than by any other instrumentality. A liberal supply of pails, well scattered throughout the premises and kept constantly filled, provides an excellent safeguard against fire.

Watchmen are proverbially sleepy; hence the desirability, if not the absolute necessity, for the use of watchmen's clocks and watches, to secure regular and systematic inspection of the premises during night and holidays.

A good system for conveying an alarm of fire to employees, and especially to the members of the private fire department, should be devised by the factory owner. Promptness may mean the safety of your property, when delay would cause its loss.

A generous supply of hand fire extinguishers will contribute much toward the safety of your premises.

Fire prevention is better than fire insurance for a reputable house. Insurance companies may indemnify you fully for direct loss, but they will not and cannot make good the loss occasioned by the stoppage of your business, such as loss of old customers and old and skilled employees.

Hand grenades are particularly adapted for use in some lines of business, and in special locations—possibly they would suit your needs.

It will be found economical in the end to purchase thoroughly good hose, even though the price is somewhat higher than other hose said to be "just as good."

A supply of efficient fire escapes may be the means of saving many lives. A life saving net is an excellent addition to the factory apparatus.

None but approved safety lanterns should be used by watchmen and others in a factory, especially in one containing inflammable goods.

Concerns still clinging to the use of sawdust in cuspidors should substitute sand.

Be careful in your choice of executive men for your private fire department. Have those only in power whose authority will be recognized, who are cool and ready in emergencies, and who live near the establishment.

If you use, or intend using, acetylene gas, make certain that your generator is of a type approved by underwriters, that it is properly situated, and that you are violating no rule concerning storage of calcium carbide.

Bear in mind that, while acetylene gas, under certain conditions, is as safe as ordinary illuminating gas, under certain other conditions it has highly explosive qualities. Be sure you are right—then go ahead.

It has been aptly remarked that "a pail of water at the beginning will extinguish any fire, provided the pail of water is there, and some one to use it." Also that a sprinkler "is itself the first pail, but it requires no human agency to operate it. It is on duty night and day."

Consider that from $110,000,000 to $150,000,000 worth of property is absolutely annihilated by fire in the United States yearly—that amount of wealth is totally destroyed, the greater part of it falling upon the people as a whole through the equalizing process of insurance. Does not your duty to yourself and to society demand that you use every safeguard against the ravages of fire?

When a factory burns the owner and the insurance companies are not the only sufferers. The loss is felt throughout the community in which it is located. Workmen are thrown out of employment and are obliged to ask credit for household necessities, making the tradesmen slow in their payments; thus the effects are felt in an ever widening circle. Every possible means should be used to avert such a calamity.

Rubbish, if permitted to accumulate, is extremely likely to some day cause a fire. This is especially true if oily rags, cotton or sawdust form a part of the accumulation, for then spontaneous combustion is apt to occur, and another mysterious fire, with no imaginable cause, is reported.

Stoves and stovepipes have caused many fires. Pipes should always be securely fastened, particularly when passing through walls or partitions; and the sheet of tin or zinc placed under the stove should project for a considerable distance in front of it, to prevent damage by live coals.

Do not permit any joists to run into the mason work of a chimney, as the chimney, in settling, is apt to crack in such a way that the wood will be exposed to the action of the fire. Watch chimneys closely and remedy defects promptly.

If your building is heated by a hot-air furnace, see that ample space (at least one foot) is left between the furnace, smoke pipe and heat pipes, and the joists above them. Better further project the joists by a fireproof covering.

With the increasing use of electricity for light and power, the number of fires attributable to stray electricity is growing. Elaborate rules have been promulgated by organized underwriters, electricians and architects to insure the safe installation of electrical plants; but the actual safety depends very largely upon the honesty and conscientiouness of the local electrician who does the work. Most of his work is covered up so that it is almost impossible to detect existent defects.

Use sand for the absorption of oil drippings, not sawdust.

Never deposit ashes in a wooden receptacle.

There are several preparations for rendering fabrics practically fireproof. If you have gas jets in proximity to curtains, have the latter fireproofed.

Mansard and shingled roofs, wooden awnings, blind attics, etc., do not find favor with underwriters.

Use only a good quality of bricks and mortar in the construction of chimneys.

The use of kerosene on floors when sweeping, or of sawdust on floors, adds to the fire hazard and the insurance premium.

Holiday decorations in stores in which lights and flimsy fabrics are utilized, constitute a positive fire risk.

Keeping merchandise in tin-covered boxes, or on skids or platforms raised above the floor, or on the grade floor of building, all tend to reduce the liability to damage by fire or water.

Coinsurance may be briefly defined as the carrying or insuring of a portion of his risk by the owner in case his insurance in companies falls below a certain fixed percentage of the value of his insured property. A concession in premium rate is usually granted for a high percentage coinsurance clause.

Keeping goods in fireproof safes reduces risk and premium.

Guard against the freezing of hydrants and valves.

Remember that heat has a great expansive effect on iron pillars and beams, which should be thoroughly protected by some non-conducting material.

Put in cut-offs or fire-stops at every floor of your building and wherever feasible, so that fire will not have free play through the interior of partitions.

Where heavy timbers are used in construction bore a hole through the core, and others transversely at ends to prevent dry rot.

Wrought iron is much more affected by the attack of rust than is cast iron. A covering of lime mortar tends to prevent deteriation of iron by rust.

Have your fire doors and shutters made by a competent mechanic, according to the underwriters' specifications; otherwise they may be unsuitable for the purpose for which they are made.

Though insurance companies may reimburse you for the monetary loss sustained by the burning of such highly valued effects as paintings, libraries, gems and heirlooms, the things themselves cannot be replaced.

When installing a sprinkler system, be thorough; protect every portion of your plant, placing sprinklers under large shelves, platforms, racks, etc., where the water distributed by the ceiling heads might not reach and quench a fire.

A dry-pipe valve should be enclosed in an insulated closet. On cold nights it is advisable to keep a lighted lantern in this closet to provide additional warmth and prevent the valve from freezing.

Keep the valves in sprinkler supply pipes always open.

Valued Policy Laws.—The States named below have laws providing that, in event of the total destruction of insured property, the full amount of the insurance thereon shall be paid. While the laws differ in the various States, their intent is to enforce a practical valuation of insured property at the time the insurance is written:

Arkansas.
Delaware.
Florida.
Georgia.
Iowa.
Kansas.
Kentucky.
Minnesota.
Mississippi.
Missouri.
Nebraska.
New Hampshire.
Ohio.
Oklahoma Ter.
Oregon.
South Carolina.
Texas.
Virginia.
Washington.
West Virginia.
Wisconsin.

Resident Agents Laws.—Certain States have adopted statutes which provide that all insurance written upon property within the State must be written by an agent who is a resident of the State. The States having laws of this class are Alabama, Arizona, California (general agent), Colorado, Connecticut, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, North Carolina (general agent), North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Tennessee, Texas, Vermont, Virginia, Washington and Wisconsin.

Anti-Coinsurance Laws.—Legislation inimical to the use of coinsurance clauses has been adopted in Indiana, Iowa, Michigan, Minnesota, Missouri, Montana, New Hampshire, Ohio, Tennessee and Wisconsin. A coinsurance clause is one which requires the insured to carry a certain proportion of the fire risk himself in case the insurance carried does not reach a fixed percentage of the value of the insured property.

Anti-Compact Laws.—Laws now appear on the statute books of the States of Alabama, Arkansas, Georgia, Illinois, Iowa, Kansas, Louisiana, Michigan, Mississippi, Missouri, Montana, Nebraska, New Hampshire, Ohio, South Carolina, Texas, Virginia, Washington and Wisconsin, which forbid in some manner the combination of insurance companies for the fixing of rates, etc.

Deposit Laws.—Deposits are now required by various States of fire insurance companies as follows: Georgia, $10,000; New Mexico, $10,000; New York, of foreign companies, $200,000, and of other State companies under retaliatory laws only; Ohio, of foreign companies, $100,000; Oregon, of all except companies of that State, $50,000; South Carolina, of companies not having $100,000 capital, $10,000; Virginia, five per cent of capital, but not less than $10,000, nor more than $50,000.

TABLE OF SHORT RATES FOR TERMS LESS THAN A YEAR.

IN USE ON THE PACIFIC COAST.

ANNUAL PREMIUM.	Cts. 50	Cts. 55	Cts. 60	Cts. 65	Cts. 70	Cts. 75	Cts. 80	Cts. 85
2 days or less	2	2	2	2	2	3	3	3
5 days or less	3	4	4	4	5	5	5	6
10 days or less	5	6	6	7	7	8	8	9
15 days or less	7	7	8	9	9	10	11	11
20 days or less	8	9	10	11	12	13	13	14
1 month or less	10	11	12	13	14	15	16	17
45 days or less	14	15	17	18	19	21	22	23
2 months or less	15	17	18	20	21	23	24	26
75 days or less	19	21	23	24	26	28	30	32
3 months or less	20	22	24	26	28	30	32	34
4 months or less	25	28	30	33	35	38	40	43
5 months or less	30	33	36	39	42	45	48	51
6 months or less	35	39	42	46	49	53	56	60
7 months or less	38	41	45	49	53	56	60	64
8 months or less	40	44	48	52	56	60	64	68
9 months or less	43	47	51	55	60	64	68	73
10 months or less	45	50	54	59	63	68	72	77
11 months or less	48	52	57	62	67	71	76	81

ANNUAL PREMIUMS.	Cts. 90	Cts. 100	Cts. 110	Cts. 125	Cts. 150	Cts. 175	Cts. 200	Cts. 225
2 days or less	3	3	4	4	5	6	7	8
5 days or less	6	7	4	8	10	12	13	15
10 days or less	9	10	11	13	15	18	20	23
15 days or less	12	13	15	17	20	23	27	30
20 days or less	15	17	18	21	25	29	33	38
1 month or less	18	20	22	25	30	35	40	45
45 days or less	25	28	30	34	41	48	55	62
2 months or less	27	30	33	38	45	53	60	68
75 days or less	34	38	41	47	56	66	75	85
3 months or less	36	40	44	50	60	70	80	90
4 months or less	45	50	55	63	75	88	1.00	1.13
5 months or less	54	60	66	75	90	1.05	1.20	1.35
6 months or less	63	70	.77	88	1.05	1.23	1.40	1 58
7 months or less	68	75	83	94	1.13	1.31	1.50	1.69
8 months or less	72	80	88	1.00	1.20	1.40	1.60	1.80
9 months or less	77	85	94	1.06	1.28	1.49	1.70	1.91
10 months or less	81	90	99	1.13	1.35	1.58	1.80	2.03
11 months or less	86	95	1.05	1.19	1.43	1.66	1.90	2.14

ANNUAL PREMIUM.	Cts. 250	Cts. 275	Cts. 300	Cts. 350	Cts. 400	Cts. 450	Cts. 500
2 days or less	8	9	10	12	13	15	17
5 days or less	17	18	20	25	28	32	35
10 days or less	25	28	30	35	40	45	50
15 days or less	33	37	40	46	52	60	65
20 days or less	42	46	50	60	68	77	85
1 month or less	50	55	60	70	80	90	1.00
45 days or less	69	76	83	98	1.12	1.26	1.40
2 months or less	75	83	90	1.05	1.20	1.35	1.50
75 days or less	94	1.03	1.13	1.33	1.52	1.71	1.90
3 months or less	1.00	1.10	1.20	1.40	1.60	1.80	2.00
4 months or less	1.25	1.38	1.50	1.75	2.00	2.25	2.50
5 months or less	1.50	1.65	1.80	2.10	2.40	2.70	3.00
6 months or less	1.75	1.93	2.10	2.45	2.80	3.15	3.50
7 months or less	1.88	2.06	2.25	2.63	3.00	3.38	3.75
8 months or less	2.00	2.20	2.40	2.80	3.20	3.60	4.00
9 months or less	2.13	2.34	2.55	2.98	3.40	3.83	4.25
10 months or less	2.25	2.48	2.70	3.15	3.60	4.05	4.50
11 months or less	2.38	2.61	2.85	3.33	3.80	4.29	4.75

NOTE.—The rates per annum, from 50 cents to 500 cents (or 5 per cent) are shown in the upper row of figures; and the days below indicate the tariff from two days to eleven months.

TABLE OF SHORT RATES FOR TERMS OF TWO TO FIVE YEARS.

IN USE ON THE PACIFC COAST.

Time Expired.	Term Two Years.	Term Three Years.	Term Four Years.	Term Five Years.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
1 month	13	10	08½	07½
2 months	20	17	13	11½
3 “	25	20	18	15½
4 “	30	23½	20	18
5 “	35	27	22½	20
6 “	40	30	25	22
7 “	45	33½	27½	24
8 “	50	37	30	26
9 “	55	40	32½	28
10 “	60	43½	35	30
11 “	65	47	37½	32
12 “	70	50	40	34
13 “	72½	53½	42½	36
14 “	75	57	45	38
15 “	77½	60	47½	40
16 “	80	63½	50	42
17 “	82½	67	52½	44
18 “	85	70	55	46
19 “	87½	72	57½	48
20 “	90	73½	60	50
21 “	92½	75	62½	52
22 “	95	77½	65	54
23 “	97½	79	67½	56
24 “	100	80	70	58
25 “	----	81½	71	60
26 “	----	83	72½	62
27 “	----	85	74	64
28 “	----	86½	75	66
29 “	----	88	76	68
30 “	----	90	77½	70
31 “	----	91½	79	71
32 “	----	93	80	72
33 “	----	95	81	73
34 “	----	96½	82½	74
35 “	----	98	84	75
36 “	----	100	85	76
37 “	----	----	86	77
38 “	----	----	87½	78
39 “	----	----	89	79
40 “	----	----	90	80
41 “	----	----	91	81
42 “	----	----	92½	82
43 “	----	----	94	83
44 “	----	----	95	84
45 “	----	----	96	85
46 “	----	----	97½	86
47 “	----	----	99	87
48 “	----	----	100	88
49 “	----	----	----	89
50 “	----	----	----	90
51 “	----	----	----	91
52 “	----	----	----	92
53 “	----	----	----	93
54 “	----	----	----	94
55 “	----	----	----	95
56 “	----	----	----	96
57 “	----	----	----	97
58 “	----	----	----	98
59 “	----	----	----	99
60 “	----	----	----	100

STANDARD SHORT RATE SCALE
FOR COMPUTING PREMIUMS FOR TERMS LESS THAN ONE YEAR.

AS ADOPTED BY THE "WESTERN UNION."

NOTE.—Take the percentage indicated in scale opposite the number of days risk is to run, on the premium for one year at given rate, and the result will be the premium earned in case of cancellation, or to be charged in case of short risks.

1 Day	2 per cent of annual prem.	55 Days	29 p. c. of ann. prem
2 Days	4 " " "	60 "	30 " " "
3 "	5 " " "	65 "	33 " " "
4 "	6 " " "	70 "	36 " " "
5 "	7 " " "	75 "	37 " " "
6 "	8 " " "	80 "	38 " " "
7 "	9 " " "	85 "	39 " " "
8 "	9 " " "	90 " or 3 mos.	40 " " "
9 "	10 " " "	105 "	45 " " "
10 "	10 " " "	120 " or 4 mos.	50 " " "
11 "	11 " " "	135 "	55 " " "
12 "	12 " " "	150 " or 5 mos.	60 " " "
13 "	13 " " "	165 "	65 " " "
14 "	13 " " "	180 " or 6 mos.	70 " " "
15 "	14 " " "	195 "	73 " " "
16 "	14 " " "	210 " or 7 mos.	75 " " "
17 "	15 " " "	225 "	78 " " "
18 "	16 " " "	240 " or 8 mos.	80 " " "
19 "	16 " " "	255 "	83 " " "
20 "	17 " " "	270 " or 9 mos.	85 " " "
25 "	19 " " "	285 "	88 " " "
30 "	20 " " "	300 " or 10 mos.	90 " " "
35 "	23 " " "	315 "	93 " " "
40 "	26 " " "	330 " or 11 mos.	95 " " "
45 "	27 " " "	360 " or 12 mos.	100 " "
50 "	28 " " "		

SCALE FOR COMPUTING EARNED PREMIUM ON TERM POLICIES CANCELED BEFORE EXPIRATION.

THREE YEARS.

For 3 months or less	20 per cent of term premium
Over 3 and not exceeding 6 months	30 " " "
" 6 " " 9 "	40 " " "
" 9 " " 12 "	50 " " "
" 12 " " 15 "	60 " " "
" 15 " " 18 "	70 " " "
" 18 " " 21 "	75 " " "
" 21 " " 24 "	80 " " "
" 24 " " 27 "	85 " " "
" 27 " " 30 "	90 " " "
" 30 " " 33 "	95 " " "
" 33 months	100 " " "

FIVE YEARS.

For 5 months or less	20 per cent of term premium
Over 5 and not exceeding 10 months	30 " " "
" 10 " " 15 "	40 " " "
" 15 " " 20 "	50 " " "
" 20 " " 25 "	60 " " "
" 25 " " 30 "	70 " " "
" 30 " " 35 "	75 " " "
" 35 " " 40 "	80 " " "
" 40 " " 45 "	85 " " "
" 45 " " 50 "	90 " " "
" 50 " " 55 "	95 " " "
" 55 months	100 " " "

EXPLANATION.—When companies cancel a policy they return *pro rata* premium. When the policyholders cancel the above table is used so that the companies shall not have to return but the *pro rata* premium less the expense of getting the business.

SHORT RATE TABLE AND RULES GOVERNING SAME.

AS ADOPTED BY THE NEW YORK FIRE INSURANCE EXCHANGE.

All insurances for a term less than a year shall be charged according to the scale for periods less than one year, but insurance may be once renewed for the ratio of the premium required for the term for which the original policy or last renewal was made, provided the renewal is made within ten days from the expiration of the policy, and provided the last preceding term was one year, or a term charged for according to the scale of insurance for less than a year.

All insurance for a term less than one month shall be charged for the portion of a month, according to the short rate scale; but in no case shall this clause be so construed as to conflict with the following clause relating to cancellations, viz:

A policy may be-canceled at any time at the request of the assured, in which case the company shall retain the customary short rate for the term the policy has been in force; but in all cases, except that of policies on contracts of listed stores written for a month or more, fractional parts of a month shall be charged the full month's premium; no return to be made on a policy written for a period less than one month.

The intention of the above is ruled to be as follows, viz: Policies on contents of listed storage stores can be canceled for less than one month at short rates for the fractional part of a month; but if both written and carried for more than one month, fractional parts of a month cannot be allowed for in cancellation.

	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.
ANNUAL RATE	25	30	35	40	45	50	55	60	65	70
1 Day	1	1	1	1	1	1	1	1	1	1
2 Days	1	1	1	2	2	2	2	2	3	3
3 Days	1	2	2	2	2	3	3	3	3	4
4 Days	2	2	2	2	3	3	3	4	4	4
5 Days	2	2	2	3	3	3	4	4	4	5
10 Days	3	3	4	4	5	5	6	6	7	7
15 Days	3	4	5	5	6	7	7	8	9	9
20 Days	4	5	6	7	8	8	9	10	11	12
1 Month	5	6	7	8	9	10	11	12	13	14
2 Months	8	9	11	12	14	15	17	18	20	21
3 Months	10	12	14	16	18	20	22	24	26	28
4 Months	13	15	18	20	23	25	28	30	33	35
5 Months	15	18	21	24	27	30	33	36	39	42
6 Months	18	21	25	28	32	35	39	42	46	49
7 Months	19	23	26	30	34	38	41	45	49	53
8 Months	20	24	28	32	36	40	44	48	52	56
9 Months	22	26	30	34	38	43	47	51	55	60
10 Months	23	27	32	36	41	45	50	54	59	63
11 Months	24	29	33	38	48	48	52	57	62	67

	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.
ANNUAL RATE	75	80	85	90	95	100	110	125	150	175
1 Day	2	2	2	2	2	2	2	3	3	4
2 Days	3	3	3	4	4	4	4	5	6	7
3 Days	4	4	4	5	5	5	6	6	8	9
4 Days	5	5	5	5	6	6	7	8	9	11
5 Days	5	5	6	6	6	7	7	8	10	12
10 Days	8	8	9	9	10	10	11	13	15	18
15 Days	10	11	11	12	13	13	15	17	20	23
20 Days	13	13	14	15	16	17	18	21	25	29
1 Month	15	16	17	18	19	20	22	25	30	35
2 Months	23	24	26	27	29	30	33	38	45	53
3 Months	30	32	34	36	38	40	44	50	60	70
4 Months	38	40	43	45	48	50	55	63	75	88
5 Months	45	48	51	54	57	60	66	75	90	105
6 Months	53	56	60	63	67	70	77	88	105	123
7 Months	56	60	64	68	71	75	83	94	113	131
8 Months	60	64	68	72	76	80	88	100	120	140
9 Months	64	68	72	77	81	85	94	106	128	149
10 Months	68	72	77	81	86	90	99	113	135	158
11 Months	71	76	81	86	90	95	105	119	143	166

SHORT RATE TABLE—*Continued.*

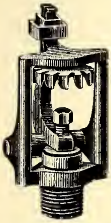
	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.
ANNUAL RATE	200	225	250	275	300	325	350	375	400	450	500
1 Day	4	5	5	6	6	7	7	8	8	9	10
2 Days	8	9	10	11	12	13	14	15	16	18	20
3 Days	10	11	11	13	15	16	18	19	20	23	25
4 Days	12	14	15	17	18	20	21	23	24	27	30
5 Days	13	15	17	18	20	22	23	25	27	30	33
10 Days	20	23	25	28	30	33	35	38	40	45	50
15 Days	27	30	33	37	40	43	47	50	53	60	67
20 Days	33	38	42	46	50	54	58	63	67	75	83
1 Month	40	45	50	55	60	65	70	75	80	90	100
2 Months	60	68	75	83	90	98	105	113	120	135	150
3 Months	80	90	100	110	120	130	140	150	160	180	200
4 Months	100	113	125	138	150	163	175	188	200	225	250
5 Months	122	135	150	165	180	195	210	225	240	270	300
6 Months	140	158	175	193	210	228	245	263	280	315	350
7 Months	150	169	188	206	225	244	263	281	300	338	375
8 Months	160	180	200	220	240	260	280	300	320	360	400
9 Months	170	191	213	234	255	276	298	319	340	383	425
10 Months	180	203	225	248	270	293	315	338	360	405	450
11 Months	190	214	238	261	285	309	333	356	380	428	475

SHORT RATE TABLE FOR TERM POLICIES.

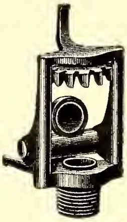
The following table must be used.

Time the Policy Has Been in Force. Compute from Date of Policy.	If Written for Two Years Retain	If Written for Three Years Retain	If Written for Four Years Retain	If Written for Five Years Retain	Time the Policy Has Been in Force. Compute from Date of Policy.	If Written for Two Years Retain	If Written for Three Years Retain	If Written for Four Years Retain	If Written for Five Years Retain
	%	%	%	%		%	%	%	%
1 month	13	10	8	7	31 months	--	91	79	71
2 months	20	17	12	11	32 months	--	93	80	72
3 months	25	20	16	15	33 months	--	95	82	73
4 months	30	23	20	18	34 months	--	96	83	74
5 months	35	27	23	20	35 months	--	98	84	75
6 months	40	30	26	22	36 months	--	100	85	76
7 months	45	33	28	24	37 months	--	--	87	77
8 months	50	37	30	26	38 months	--	--	88	78
9 months	55	40	33	28	39 months	--	--	89	79
10 months	60	43	36	30	40 months	--	--	90	80
11 months	65	47	38	32	41 months	--	--	92	81
12 months	70	50	40	34	42 months	--	--	93	82
13 months	72	53	43	36	43 months	--	--	94	83
14 months	75	57	46	38	44 months	--	--	95	84
15 months	77	60	48	40	45 months	--	--	97	85
16 months	80	63	50	42	46 months	--	--	98	86
17 months	82	67	53	44	47 months	--	--	99	87
18 months	85	70	56	46	48 months	--	--	100	88
19 months	87	72	58	48	49 months	-	--	--	89
20 months	90	73	60	50	50 months	--	--	--	80
21 months	92	75	63	52	51 months	--	--	--	91
22 months	95	77	66	54	52 months	--	--	--	92
23 months	97	79	68	56	53 months	--	--	--	93
24 months	100	80	70	58	54 months	--	--	--	94
25 months	--	81	72	60	55 months	--	--	--	95
26 months	--	83	73	62	56 months	--	--	--	96
27 months	--	85	74	64	57 months	--	--	--	97
28 months	--	86	75	66	58 months	--	--	--	98
29 months	--	88	77	68	59 months	--	--	--	99
30 months	--	90	78	70	60 months	--	--	--	100

No other table to be used.



Upright
Closed



Upright
Open

THE WALWORTH
AUTOMATIC LINK SPRINKLER

Simple in Construction

Strong and Sensitive

Working Parts Readily Replaced

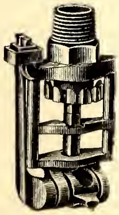
Tight Under All Pressures

Free from Danger of Accidental Opening

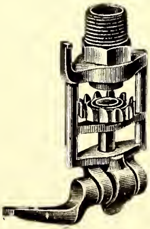
WALWORTH MFG. CO.

132 FEDERAL ST. BOSTON, MASS.

Pendant
Closed



Pendant
Open



Quarter Million in Use Kilfyre SIMPLY BLOTS IT OUT **The Standard of Merit**

A Fire Department in Itself

Meets all Conditions **Good in any Climate**

Price Within the Reach of Everyone

Designed for General Use **Can be Used by Anyone**

No Liquid, Can't Corrode, Explode, or Freeze

Nothing to Get Out of Order or Confuse the Operator

Kilfyre SIMPLY BLOTS IT OUT

Has been endorsed and adopted by Fire Departments, Insurance Companies, Boards of Underwriters, Chemists, Experts, Electricians, the Press and Public wherever it has been introduced.

After many experiments and severe tests it has been adopted for general use by the United States Government for transport service, army posts and arsenals; The Standard Oil Co. for warehouses, refineries, offices, etc.; The Western Union Telegraph Company for switchboards, buildings, offices, etc.

Kilfyre SIMPLY BLOTS IT OUT

Has proven its value in actual use as a sure and ever ready safeguard against incipient fires in Cotton and Woolen Mills, Hat and Woodworking factories, Oil Mills and Refineries, Steamships, Railroad Coaches, Depots, Shops, Hotels, Theatres, Halls, Restaurants, Gas Houses, Electric Street Cars, Telephone Exchanges, Telegraph Switchboards, Electric Light Stations, Barns, Stables, Factories, Stores, Dwellings, etc.

We are the originators and sole owners of the Dry Powder process, and we take this opportunity to warn the public generally against imitators and infringers, who will be prosecuted to the full extent of the law, as heretofore.

DESIRABLE UNOCCUPIED TERRITORY

Write for our combination booklet of actual fires, Fire Departments' indorsements, Underwriters' approvals, Equipments, Press Opinions, etc. also for our booklet "DANGEROUS TO HANDLE," a review of the uncertainty of mechanical and automatic devices.

Estimates for Equipments Furnished on Application

Address all communications Agencies in all principal cities.

Monarch Fire Appliance Co.

(Capital $500,000)

27 WILLIAM STREET NEW YORK, U. S. A,

Daylight Prisms...

have solved the problem of projecting daylight into otherwise dark interiors. The prisms are glass plates formed of a peculiar combination of prisms and lenses by means of which daylight from the sky is caught, then deflected from its original direction, and then projected and diffused into stores, halls, rooms or basements.

Artificial lights done away with.
Gas bills saved.
Danger of fire lessened.

Address, for particulars

DAYLIGHT PRISM COMPANY,
OF PENNSYLVANIA,
128 South Fourth Street,
Philadelphia, Pa.

The Insurance Year Book.

FIRE AND MARINE INSURANCE.

Issued Annually About July 1.

A complete cyclopædia of fire and marine insurance information. The FIRE AND MARINE INSURANCE VOLUME OF THE INSURANCE YEAR BOOK contains over 800 pages. It is compiled by careful statisticians, and is always up to date. The data is derived from official reports made to insurance departments, the numerous ratios and deductions being made by expert statisticians. Its various departments embrace the following prominent features:

Statutory requirements of the different States and Territories.

Statistics and a complete directory of companies of foreign countries.

Fire and marine insurance in Canada.

A list of fire underwriters' organizations in America.

The names of the directors of agency companies.

A list of retired American companies.

A list of about 30,000 insurance agents in the United States and Canada, being the most complete list extant of men and firms engaged in the insurance business.

A comparative exhibit of American fire and marine insurance companies for five years, showing the statistics of all stock companies, and competitive mutual companies.

Transactions of fire insurance companies by States, with loss ratios in detail.

Fire protection and water supply of cities and towns having a population exceeding 1000 inhabitants. *This department presents data of great value to all interested in fire extinguishing apparatus and appliances designed to aid in reducing the enormous annual waste by fire.*

The above are but a few of the important features included in the FIRE VOLUME OF THE YEAR BOOK

PRICES OF THE YEAR BOOK:

Fire and Marine Insurance Volume, $5.00; when ordered with the Life and Miscellaneous Volume, $8.00

THE ROEBLING SYSTEM OF FIREPROOF CONSTRUCTION

Our fireproof floors have been subjected to crucial and exhaustive tests with eminently satisfactory results

They are **STRONG, PROTECT IRON WORK, PROVIDE EXCELLENT CEILINGS,** *are* **ECONOMICAL IN MATERIAL,** *and are every way practical and effective* ∴ ∴ ∴ ∴ ∴

The Roebling Construction Company

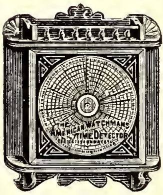
121 LIBERTY STREET, NEW YORK CITY

WORKS AT TRENTON, N. J.

Established 1882. **FOR NIGHT WATCHMEN** 12000 in use

THE AMERICAN WATCHMAN'S TIME DETECTOR

MAGNETO SYSTEM **BATTERY SYSTEM**


THE AMERICAN WATCHMAN'S TIME DETECTOR

Is approved by all the Insurance authorities.
Send for copies of Insurance letters of approval.
Seven years guarantee.

Send for catalogue and prices for Watchman's Time Detector, Electric Time System. Interior Fire Alarm System, Interior Telephones, School Program Clocks, Employees' Time Recorder, three kinds.

We also handle six varieties of the Portable Key Watches for night Watchmen.

Be sure to get our prices.

THE AMERICAN WATCHMAN'S TIME DETECTOR COMPANY

J. S. Morse, Treasurer

234 and 235 Broadway Opposite P. O. New York, N. Y.

ECO MAGNETO CLOCK CO. BOSTON

Endorsed by All Insurance Companies.

The Eco Magneto Watchman's Clock

1. Keeps an exact record of the time the watchman visits each station.
2. It dispenses entirely with a battery.
3. Simple in construction; not liable to get out of order.
4. Cannot be tampered with nor can false records be made on it.
5. Can be sent to any part of the country and set up by anyone of ordinary intelligence.

ECO MAGNETO CLOCK CO.,

620 Atlantic Ave., Boston, Mass.

New York Office, HAVEMEYER BLDG. J. P. RYAN, Manager.

Knowles' Improved Fire Pumps

The first —

Underwriter Fire Pump

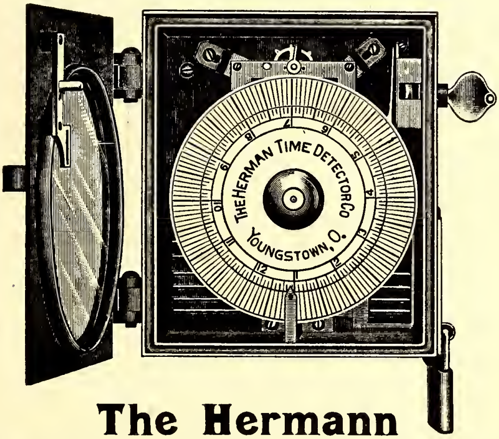
ever made in the United States was built by us and sold in 1890. We have been building them ever since, and now have more of these pumps in successful operation than any other maker in the world.

Every pump built by us is guaranteed.

We also make all other desirable forms of fire pumps.

KNOWLES STEAM PUMP WORKS,

NEW YORK, **BOSTON,**
93 Liberty Street. **183 Devonshire Street.**
CHICAGO, 163 South Canal Street.


THE HERMANN TIME DETECTOR CO
YOUNGSTOWN, O.

The Hermann Time Detector Company

SOLE MANUFACTURERS OF THE

...HERMANN WATCHMAN'S TIME DETECTOR...

OFFICE, No. 23 EAST FEDERAL ST.
YOUNGSTOWN, OHIO U. S. A.

The Gamewell Fire Alarm Telegraph Company

JOS. W. STOVER, President
H. F. BENDER, Treasurer

19 BARCLAY STREET NEW YORK

Fire Alarm and Police Signal Telegraphs for Municipalities. Over nine hundred plants in actual use.

RADICAL DEPARTURE FROM GASOLINE LAMPS.

Invented by JOS. STUBBERS

The Incandescent Light and Stove Co.,

422-426 East Pearl Street, Cincinnati, Ohio,

MANUFACTURERS OF

"THE AIRLIGHT"

The following points recommend it to insurance people:

First—One generator supplies gas for all the lights. 95 per cent. of air is mixed with the gas at generator and is conveyed by means of pipe to a point where the light is desired therefore the gasoline tank can be kept where it is most out of the way.

Second—The generator is on the level with the tank and connected thereto by a pipe leading from the top of the tank to the top of generator and a pipe leading from the bottom of generator to bottom of tank, therefore the gasoline will stand in the generator on the level with that in the tank at all times. The needle valve is located at a higher level, consequently the gasoline can never leak out of defective valves or when valves should be left open. The fill can which goes with each machine, positively prevents the spilling of gasoline while filling the tank or overfilling same. For these two reasons we prevent the spilling of gasoline. The spilling of gasoline is the cause of all accidents with same.

The light produced by the AIRLIGHT is superior to arc lights, requires less attention than one single GASOLINE or coal oil lamp. 5,000 of them in use. Endorsed by the South-eastern Tariff Association and a number of other Boards.

SEND FOR LIST PRICE AND DESCRIPTIVE CATALOGUE.

HAVE YOU INVESTIGATED

Acetylene
Gas Light

It is the most brilliant and beautiful light yet discovered.

It is a pure white light.

By it colors can be distinguished accurately.

Its combustion is perfect, and it vitiates the atmosphere less than does ordinary gas.

The pipes will not freeze up, as the gas is delivered dry.

It is cheaper, on a candle-power basis, than any other illuminant.

It it safer than ordinary illuminating gas.

It can be readily placed in use in either city or country.

No skilled labor is required for its manipulation.

All the requirements for safety, economy and a satisfactory light are combined in

THE ECLIPSE

Patent Automatic Acetylene Gas
Apparatus

Which has the approval of Underwriters.

MADE BY

Eclipse Manufacturing Co.,

269 DEARBORN STREET, : : : : CHICAGO, ILL.

The SPECTATOR COMPANY

PUBLISHERS OF AND ......IMPORTERS OF **INSURANCE WORKS.**

Publishers of the following Important Fire Publications:

THE SPECTATOR.—An American Review of Insurance and Kindred Subjects, such as Fire Protection and Prevention. Published weekly. Price, $4.00 per annum.

THE INSURANCE YEAR BOOK.—Issued July of each year. Dealing with insurance companies throughout the world, together with much information of value to all connected directly or indirectly with insurance. Price of each volume: Fire and Marine Insurance, $5.00; Life and Miscellaneous Insurance, $5.00. Both volumes, when order together. $8.00.

READY RECKONER OF EARNED AND UNEARNED PREMIUMS.—By Wm. Ellsworth. An invaluable assistant in the rapid computation of return premiums at short rates and pro rata. Price, $5.00.

FIRE INSURANCE LAW CHART.—Contains in tabular form a summary of special State Laws relating to statements required of fire insurance companies. Price, $1.00.

SPECIAL AGENTS' ELECTRICAL HAND-BOOK.—By A. M. Schoen. Price, $1.00.

FIRE INSURANCE POCKET INDEX.—Exhibits statistics for many years of nearly 300 American and foreign fire insurance companies. Prices, Manilla Cover, 25 cents; in Flexible Leather Pocket Book, 50 cents.

READY REFERENCE LEDGER.—By Turner. Affords a complete exhibit at any time of the business for each company. Price, $3.00.

SPONTANEOUS COMBUSTION, REPORT OF A SPECIAL COMMITTEE ON.—By Holloway. Price, 25 cents.

SPONTANEOUS COMBUSTION, ESSAYS ON.—By Hexamer. Price, 50 cents.

CLASSIFICATION OF FIRE RISKS.—By Barton & Arnold. A simple, effective and economical system. Price, $7.00.

ELECTRIC WIRING.—For the use of architects, underwriters and the owners of buildings. By Russell Robb. Price, $2.50.

FIRE INSURANCE AGENTS' AND SURVEYORS' BOOK OF INFORMATION.—Price, $1.25.

TORNADOES AND TORNADO INSURANCE.—Price, 25 cents.

DISTRIBUTION BY STATES OF FIRE INSURANCE IN THE UNITED STATES.—Prices: in Manilla Cover, $1.00; in Flexible Leather Cover, $1.50.

SPECIAL AGENT'S AND ADJUSTER'S COMPANION.—By W. P. Lucas. Price, $1.50.

FIRE UNDERWRITING PROFITS AND LOSSES FOR A DECADE. —Single copies, 10 cents.

UNDERWRITING AND INVESTMENT PROFITS AND LOSSES FOR 1899.—Single copies, 10 cents.

AGENTS' WALLET, OR POCKET BOOK.—No. 1, 9¼ x 4⅜ inches, 50 cents; No. 2, 10 x 4½ inches, 60 cents; No. 3, 11 x 5 inches, 75 cents. Special size, 10 x 5 inches, with two pockets, $1.00.

JOYCE ON INSURANCES.—A cyclopædia of all legal insurance works brought up to date, containing rules and definitions, comparisons and conflicting decisions, separate chapters on technical points, pertaining to particular classes of insurance. Four volumes of 1000 pages each, being a compendium of insurance law. Price, $24.00.

Also Numerous Other Standard Insurance Works.

SOLE AGENTS FOR THE UNITED STATES FOR THE FOLLOWING WORKS:

TECHNOLOGICAL FIRE INSURANCE COMMENTARY.—By Wm. A. Harris. Price, $6.50.

TECHNOLOGICAL DICTIONARY OF INSURANCE CHEMISTRY. By Wm. A. Harris. Price, $6.50.

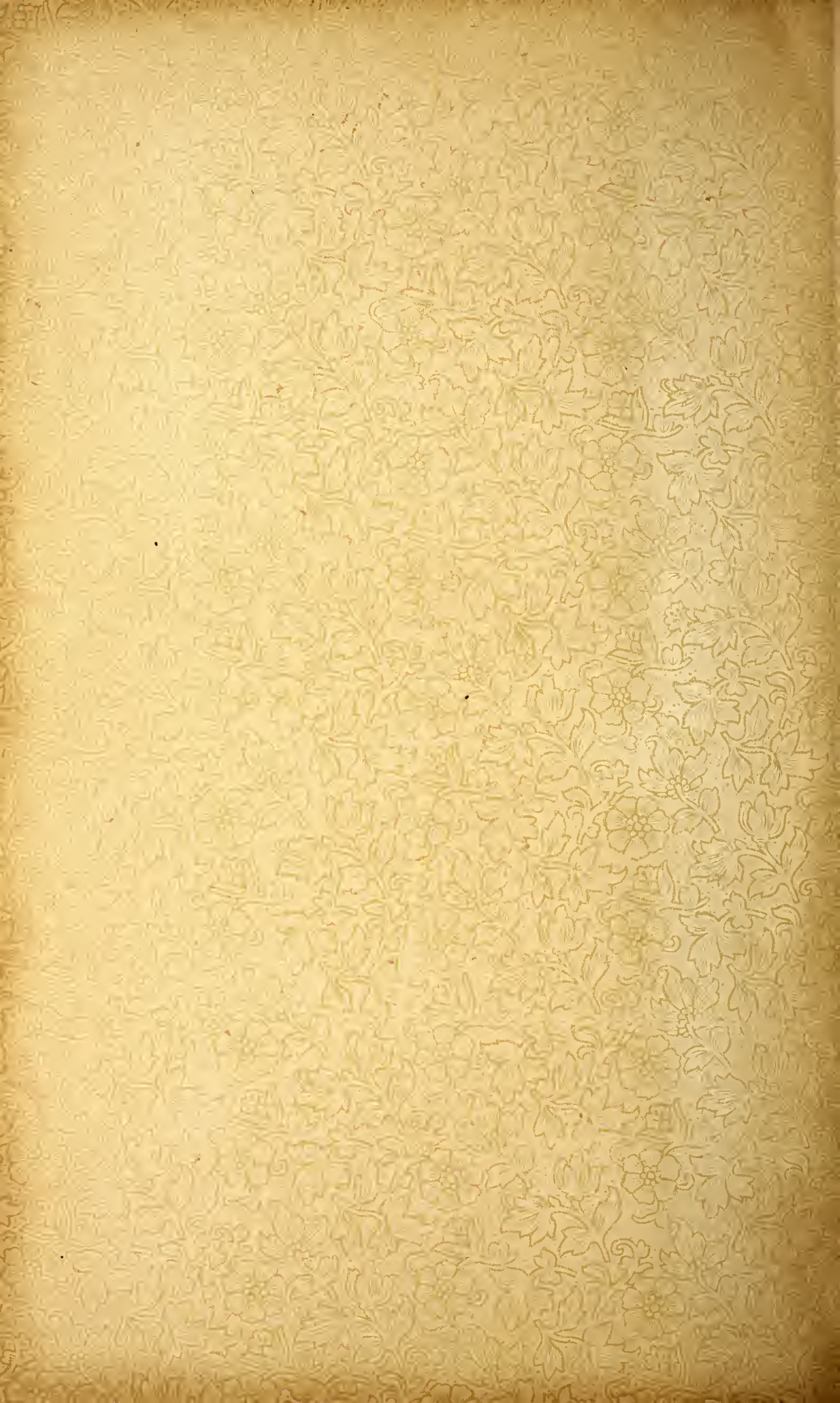
TECHNOLOGICAL FIRE INSURANCE DICTIONARY.—By Wm. A. Harris. Price, $6.50.

THE INSURANCE BLUE-BOOK AND GUIDE FOR 1899-1900.—A British and Colonial hand-book of insurance information. Prices: in limp cloth cover, $1.00; in half morocco, $2.00.

Also Sole Agents for all Works Handled by CHARLES & EDWIN LAYTON of London.

A Catalogue of Insurance Publications will be forwarded on receipt of five cents in postage stamps. Address,

THE SPECTATOR COMPANY, 95 William Street, New York,



SMITHSONIAN INSTITUTION LIBRARIES
3 9088 00645 0274